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FROM OQAIR TO THE RUINS OF SALWA

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IN the early spring of 1921, owing to Sir Percy Cox's absence from Baghdad to attend the Colonial Secretary's Conference at Cairo, I was able to obtain leave for a short journey round the Persian Gulf, to visit some of the unfrequented islands and to investigate the movements of migratory birds. I hoped to discover one of the main routes taken by a vast stream of birds which leave their winter quarters in Africa and gain their summer and breeding grounds in Persia, Caucasia, and further north, passing through Arabia and across the Persian Gulf. This led me to include a part of the Arabian coast in the projected itinerary.

On the eve of my departure Mr. H. St. J. B. Philby suggested that my selection should fall on the coastline near Bahrain, which runs south of Oqair, locally pronounced Ojair, forming the bay of Salwa; because, in addition to the ornithological interest, it might then be possible to visit the ruins which were reported here, and mentioned in the 'Persian Gulf Pilot' as extensive. There was a possibility that this might be the site of the ancient Phœnician port of Gerra. This coast is unmapped and has never been visited by a European, although Burchardt in 1904 passed Salwa on another route. He was murdered near Hodeida in 1909 and left few details.

I determined, on my way through Basra, to borrow the necessary instruments so that a map of the country might be made. The Civil Works Department were able to provide a 6-inch theodolite, but our search for a pocket chronometer failed. I eventually sailed in the Royal Indian Marine ship *Nearchus* with the theodolite and a large ship's chronometer, which was discovered in the offices of the Inland Water Transport.

After the projected circuit of the Gulf Islands, to visit lighthouses and lightships, the *Nearchus* landed me at Bahrain on March 24. Meanwhile the navigating officer, by means of the midnight wireless time signal from Nauen, had obtained a good rate for the chronometer.

During the preparation for the journey I was kindly entertained by the British Political Agent at Bahrain, Major Daly. A message was

sent to the Governor of Hasa, Abdulla ibn Jeluwi, the representative of the Sultan of Nejd in Hufuf, asking permission to travel in his province to look for ruins; and he was requested to send an escort with necessary camels and equipment to Oqair to undertake the journey along the coast to Salwa.

It was necessary on account of my bulky instruments to hire a small sailing boat which would accompany us parallel to our daily march, and waiting at a pre-arranged meeting-place every evening, send out a rowing boat to fetch me aboard to wind the chronometer and sleep: a ship's chronometer on a jolting camel would be useless.

While waiting for a reply from Hufuf it was possible to see much of interest in the island. The ruling Shaikh of Bahrain, Isa ibn Ali al Khalifa, had reigned for fifty-four years. At his accession the seas and islands were a nest of pirates, who harassed the trade of Bahrain and the whole of the Persian Gulf. With the support of the British Government he waged relentless war on these buccaneers and exterminated them, transforming his domain from a hotbed of lawlessness into one of peace and security. In 1923, two years after my visit, Shaikh Isa found active government too great a strain at his advanced years, and ceded most of the administration to his son Hamad ibn Isa, a man of progressive ideas.

Bahrain is the largest of a group of islands on the south-west shore of the Persian Gulf. It owes its commercial importance to its position as the centre of the pearl-fishing industry. Every year in early summer some thousand sailing boats assemble here from all the coastal and island villages in the Persian Gulf. Their movements are commanded by a senior authority corresponding to the admiral of a fleet. The oysters are raised by naked divers to the deck, where they are opened and the pearls extracted. The big pearl merchants of the world have representatives in Bahrain who wait the arrival of the fleet, so that it is no cheaper to buy here than in Bombay or Paris. But if one asks to see some pearls, a local merchant is produced, who after fumbling in his voluminous garments produces a soiled and tattered rag which is ceremoniously unrolled, until in the nethermost corner a shining array of the jewels is revealed.

There is a side industry in mother of pearl, of which the shells are also collected and landed at Bahrain. The average pearl oyster is the size of a Whitstable native, with a thin layer of mother of pearl. A much thicker layer is obtained from a larger oyster, the size of a scallop, which is collected especially for the industry. This trade was in the hands of the Germans before the war, and at the time of my visit several years' accumulation of shells was lying in heaps awaiting a purchaser.

Bahrain has also a large trade between India and Central Arabia. "British India" and other steamers call regularly, but anchor in the outer harbour 4 miles from land, on account of the shallow seas. Mer-

chandise and passengers must be transhipped to small sailing vessels. The embarcation of pilgrims in rough weather is a scene of much confusion and often of danger. The fragile craft bump against the sides of the ship as the men leap for the 20 feet of swinging rope ladders; the veiled and frightened women are put in an old rush orange basket attached to a crazy bit of cord and pulled hand over hand by their friends up the ship's side like bundles of cloth. There is a stone jetty near the Custom House where the sailing boats unload cargoes but the sea leaves it with but 2 or 3 feet of water at low tides, and even at high tides it is approached only by boats of shallow draught.

The bazaar is large, with the usual shops of an Eastern town: boat builders, cloth merchants selling Indian and Manchester cotton goods, weavers, coppersmiths, food and coffee shops where most of the actual buying and selling is done, and the cheap European patent and trash shops, beloved of the Indian shopkeeper. The commercial population is mainly Arab, Persian, and Indian. There is an outlying village of small huts occupied entirely by negro freed slaves, who find employment in the pearl industry, and many are pearl divers. There is a branch of a British bank and a representative of the British India S.S. Co. An American Mission supports a clergyman and a doctor with church and hospital in the town.

Sheikh Isa was in his winter residence on Maharraq Island, and formal calls were made the occasion of much ceremony. On the island pier of loose rocks six guns were showing their muzzles; they look aggressive, but are used only for salutes. A large black horse, with bright-coloured trappings, was waiting in the shallow surf, held by a black negro servant. Having helped me to mount, he led the horse through half a mile of crowded bazaar. On recognizing the state livery of the Sheikh most of the shopkeepers stood up with every sign of respect. The courtyard of the palace was thronged with retainers, some of whom shook hands, and some said "Salaam alaikum," according to their rank. Sheikh Isa received me alone in the audience roon upstairs. He was magnificently dressed and wore the long curved silver-chased Arab sword. His eyelashes were darkened with black powder, and his complexion was made up with care to hide his seventy odd years. The picture of this well-groomed old beau has made a lasting impression on my memory. He politely asked me to sit, and we exchanged platitudes until coffee was brought, followed by sweet sherbet flavoured with rose-water, which ended the refreshments. Rose-water in a silver flask followed, in which to dip the fingers. Finally, glowing sandal wood was produced; you waft the smoke towards the face with your hand, and snuffle with visible signs of enjoyment. The call was then over, and I took my leave.

There are three physical features of interest in Bahrain: the fresh-water springs, the ancient mounds or tumuli, and a volcanic hill called Jabal Dukhan. The springs are reputed to be the outflow of water

from the highlands of Central Arabia. Coming down from the mountains the torrents disappear in the sandy plains of the Nejd plateau and passing under the desert rise again in and around Bahrain. One at least discharges under the sea, and so strong is the flow that native boats are able to replenish their drinking-water from it. The overflow of the land pools is carried by channels to the gardens, and as the rainfall is insufficient to support cultivation, agriculture is entirely dependent on them for irrigation.

There are some really good date groves, extending for miles along the northern coast, and fruit gardens of pomegranate and orange trees. The tamarisk and tamarind trees grow to perfection, and the Indian "almond" (*Terminalia catappa*), but one gets the idea that horticulture is regarded more as a lucrative hobby of the wealthy residents than an industry. Small fish, being plentiful, are dried in the sun and used to make up the deficiency of fodder for dairy cattle. The cows much appreciate this strange diet, and the resulting milk and butter are excellent.

Of the mounds or tumuli covering several square miles, by far the larger number are small cone-shaped piles of gravel, just sufficient to cover the body of a man. They are only a few feet apart, and their number must run into hundreds of thousands. The few larger mounds contain rock buildings of primitive design and workmanship. Mr. F. B. Prideaux, a former Political Agent, carried out some investigations here and found human skeletons and ancient pottery in some of the chambers. The results were published in his paper, "The Sepulchral Tumuli of Bahrain," and the specimens are now in India. Mr. Bent also opened some of the mounds. But in each case the question of their origin was left much as it was before, for the evidence that they were Phœnician was not conclusive, in the opinion of most archæologists.*

In one of the trenches dug by the excavators a two-storied building of rock blocks could be seen; holes for the timbers show the position of the floor and that the rafters were round with sharpened points. The roofs were made with broad slabs of rock reaching from rock wall to rock wall. At the end of the passage another crossed at right angles, and in the corners human bones were discovered by Prideaux. The passage now contains the nest of a pair of Barn owls and the remains of their larder of small rodents.

Jabal Dukhan, 16 miles south of Bahrain harbour, is a prominent landmark for ships at sea. It rises abruptly in the middle of an otherwise flat island to a height of 440 feet. We found it to be a bare hill of loose volcanic rock, with nothing to arrest attention beyond a Hooded Wheatear (*S. monacha*), which I secured, and an ideal pirates' cave. The passage is well hidden, and entrance is gained by a stooping crawl of 20 yards

* See remarks by Dr. Hogarth (*Journal*, 56, 464) in discussion following a paper by Mr. Philby.

SHAIKH HAMAD IBN ISA

ROCK TOMB IN TUMULUS AT BAHRAIN

ADAHRI SPRING ON BAHRAIN

THE CAMEL PARTY

TYPICAL COAST OF THE BAHR SALWA

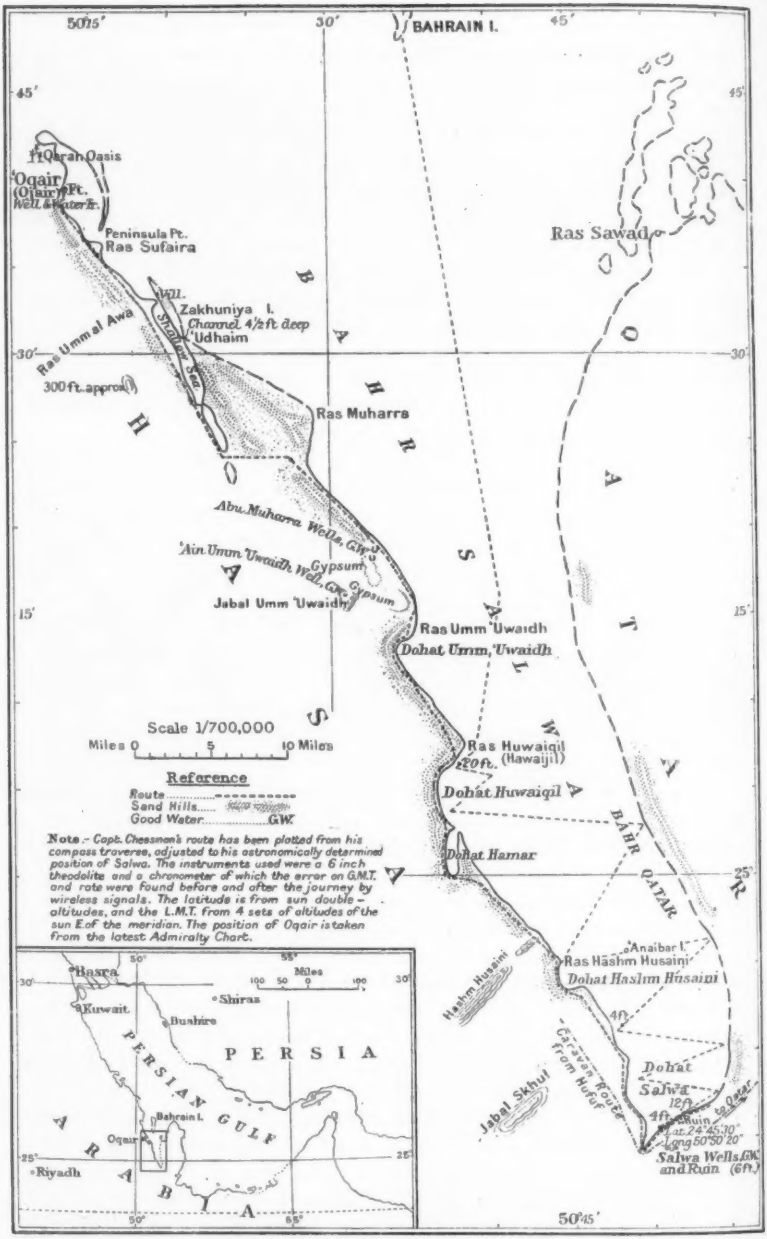
until two circular rooms 9 feet high by 6 feet wide are reached. The only tenant was a Barn owl, which in its retreat extinguished a candle-end my companion had just lighted and passed between my legs.

On March 28 Abdul Aziz Gussaibi, a local ship owner and merchant, brought Ahmad, the Nokhadar or skipper of a baghala or sailing boat, and said all was ready for a start. He was taking a cargo of corn and some passengers for Central Arabia, and after unloading them at Oqair his boat and crew would be at my service to continue the journey. Ahmad had, it appeared, been in the direction of Salwa some ten years before, and described it as a sea very little frequented because there were few bays giving shelter from storms. When fuel was scarce in Bahrain, boats ventured down there to gather desert scrub. He also said he had heard of the ruins at Salwa, which were not extensive; that it was occasionally visited by Badawin tribes; that good water was doubtful, and that he should take sufficient to be independent.

At 6 a.m. next morning we were lying becalmed inside the harbour of Oqair, but still 3 miles from the quay. The thermometer registered 63°, and a heavy dew had soaked everything. It took another two hours to row to the little jetty. The Revenue Mamur came to the boat, followed at a brief interval by the Amir of Oqair, Abdul Rahman, with a long Arab sword slung at his waist and his staff of armed retainers. After greetings he led me to his guest room for coffee, and informed me he expected the camels from the Governor of Hasa would arrive that day or the day after, and thought my quarters on the boat would be more comfortable than his house. He said the road to Salwa was difficult and would take four days, and as far as he had been able to ascertain there was no water *en route*.

I spent the morning wandering along the shore northwards of the fort or village, and took bearings with the compass when well out of sight. The coast is flat, covered with shells and coral sand, with a few flat reaches of volcanic rock on the same level. Behind the foreshore are low sand-dunes scantily bespattered with low scrub. There is very little here to attract wild life or to support it.

A pair of Kentish plover were the sole occupants of the shore, and had a nest with three eggs. Among the scrub are occasional Agama, the fleet-footed lizards of the desert which dart away and are lost to sight in a few seconds in the white glare on the sand. A pale desert hare, a white wagtail, a grey wagtail, and a wheatear were the only other tenants of this area. The afternoon was spent on the shore to the south, which was slightly more productive; a patch of rushes held a grasshopper warbler and a sedge warbler, while sand martins and hoopoes were seen. All these were making their journey through the country. I was however forming the opinion, confirmed later, that only a few migrants that had lost their way were using this route. It seems doubtful whether many of them survive the fierceness of the climate and the



Sketch-map of coast from Oqair to Salwa.

bareness of the country. Those I obtained were thin and weak, and we passed several little corpses along the seashore.

There were two sets of burrows close to the rushes, one the open earth of the gerbils and the other the mole-like mounds of the mole rats (*Nesokia*). I was wondering what these animals could possibly live on when my meditations were interrupted by the arrival of two soldiers armed with modern rifles, who had been sent by the Amir to look for me and escort me back.

The following morning the temperature at 7.30 had risen to 71°. A message came to say the camels had arrived from Hufuf, and I was introduced to Mahommad Asahali, a soldier of Ibn Jeluwi, who was to be in charge of the land party. There were three other armed soldiers and a man with three baggage camels and one delul or riding camel for me, and one for Mehdi, my Arab servant and skinner from Baghdad.

We proposed to meet the baghala in the evening opposite Zakhuniya Island, which is roughly 8 miles by sea, and possibly 12 by land. Ahmad was very anxious to do the whole journey in one if the wind was favourable, and wait for us at Salwa, which would have meant that the chronometer would not be wound. But it was difficult to arrange our stopping-places ahead, as there were few names on the map, and these as much as 20 miles out of position. Ahmad himself talked vaguely of one or two points, but was not sure of the order in which they came, while Muhammad Asahali and his men had no knowledge of the country on this side of Salwa, which they had only visited on the direct Hufuf–Qatar route.

At last at 2 p.m. of March 30 we mounted the camels, and bidding farewell to the Amir followed the coast southwards. On our immediate left was the sea, and 800 yards to our right range after range of low rolling sand-hills obscured our view landwards. The general direction of the coast was south-easterly, but circular bay followed circular bay with no outstanding landmarks to distinguish them. It was not till we reached the night's camping ground on an elevated sand-hill that I caught a glimpse of distant Oqair, and by compass bearing discovered our position.

The first headland whose name could be traced was Ras Sufaira, forming one side of the entrance to Oqair harbour. The next was a sand-hill running out to a point opposite Zahhuniya Island and was called Ras Umm al Awa. Here we camped and awaited the arrival of the baghala. Zahhuniya Island is a bare sand-mound. There appeared to be about twenty stone houses in the village on the west coast, and two baghalas were anchored close to the shore. There were no date palms, but a few camels were roaming on the higher sand-hills in the background, so there must be a little vegetation. I spent some time in watching the operation of a big black rolling beetle, one of the few energetic creatures in all Arabia. Having rolled her golf ball of camels' refuse to a suitable spot she was now busily engaged in digging a hole to bury it, and would then in all probability lay an egg beside it, and having provided for her

progeny according to her lights would leave the grub to fend for itself. The business in hand at that time was however excavation: running down the hole she got a small pile of sand in front of her head and pushed it before her out of the entrance, and then rushed down for another load. Shortly afterwards the sea was invaded by a flock of several thousands of small black Socotra Cormorant, a bird peculiar to these seas, a species of which I had just obtained the first known eggs on the islands of the Persian Gulf. As they fly the leaders settle and disappear into the sea to fish, coming up to form the rearguard, so the progress of the flock is continuous.

The baghala arrived according to programme and anchored within a quarter of a mile of the shore, as the water is shallow and the bottom is flat rocks. The little rowing boat was able to come within 20 yards. From that evening I took meals with the crew: the usual big bowl of rice, dates, and a few lumps of rather leathery meat and flat cakes of unleavened bread. It blew hard at times during the night, and as all the crew went to sleep we might have been shipwrecked before any one awoke.

Next morning a little rain fell and the wind changed to north-east. The little boat rowed me ashore, and mounting our camels we rode away at 7.30 a.m. The tryst that night was to be opposite the bluff called Hashm Husaini (nose of a fox), but we were not fated to reach it until April 2, for neither the land nor the sea party knew exactly where it was. The country bore a monotonous resemblance to that of the day before. Behind us the headland Ras Umm al Awa could be seen running out north-east-by-east in a rocky point nearly reaching Zakhuniya Island. The south end of the island is still nearer to the north point of the next promontory of Udhaim, with narrow channel only $4\frac{1}{2}$ feet deep. As usual we stopped an hour or so after the start for prayers and coffee, when the camels invariably strayed away and required a long tramp to recapture them. During the halt Salem, one of the soldiers, discovered what he said was the footprint of a hare. In great excitement he asked for my twelve-bore to be loaded and placed at full cock, and with relief I saw the tracker withdraw beyond effective range of the party. He failed however to find the hare. But on resuming the march Salem and another man were sent to make a détour to wells reputed to be situated near Jabal umm Uwaidh, and if the search were successful to bring the replenished skins to our next evening camp. We had scarcely parted from them when a rifle-shot rang out and Salem was seen approaching on a galloping camel with the hare that he had shot on the run from a moving saddle. It was a small pale specimen, and the skin was preserved. It proved to be a new race, and has been named *Lepus omanensis cheesmani* by Mr. Oldfield Thomas.

We had been led some distance westward and away from the coast by an arm of the sea, and having reached its southern end, crossed some

soft salt marshland. The men were very careful not to allow the camels to drink the sea-water, as they seemed inclined to do. We regained the coast by crossing a ridge of sand-hills and scanned the sea for the sail of the baghala. It was nowhere to be seen, and we had no idea whether it was behind or in front of us. The hills of Qatar across the bay of Salwa became visible for the first time from this point. The whole day we silently travelled along the white sandy shore, occasionally looking behind for the missing Ahmad and his boat. A crested grebe (*P. cristatus*) in perfect breeding plumage was lying dead among the sea wrack. At 4.30 we halted to examine an old camping ground indicated by the droppings of sheep, and decided that wells were in the vicinity. Two were soon discovered, mere round pits roughly dug down 12 feet into darkness. One man was let down by a rope to investigate. The first well proved dry and the second contained a very little muddy water, which he tasted and pronounced sweet. The ridge here was littered with slabs of crystal gypsum like blocks of white marble. The gypsum ridge came from the westward and ended at the sea.

Muhammad now thought that if we continued the journey, and Allah willed, we should find the baghala; but as the sun was low I decided to camp. A little tent was erected, and bread was baked by making crushed wheat into dough and burying it in the sand under a fire. The resulting bread was very solid with a liberal mixture of sand. This with a few dates made the evening meal.

Just before twilight a pale example of the Desert Lark (*Ammomanes*) was seen feeding. I had just sufficient energy left to stalk and shoot it. It will probably prove a new race, but unfortunately it was the only one obtained or seen. A party of Pallid swifts (*Micropus murinus*) had been passed during the day flying north-west up the coast. The only other birds observed were Common Bee-eater, Pallid Harrier, Crested Lark, and Blue-headed Wagtail.

Some time after nightfall the two men came in with full water-skins and brought the news that the baghala was anchored about 4 miles ahead. We were astir early next morning and found the baghala after an hour's march. I went on board and wound the chronometer. Ahmad was very apologetic for leaving us behind. He had found a favourable wind, and had rushed down regardless of instructions to keep us in sight. I threatened he would travel on a camel next day and learn to keep a better watch.

A Flamingo flying along the shore amazed the camel party. The crew did some successful fishing by an unusual and exciting method. The sea was shallow and the water as clear as glass; the white sand at the bottom showed up the fish. The men with oars and poles approached a shoal with the rowing boat and drove them close to the shore; then they leapt into the water and battered them over the heads with the sticks amid much yelling and splashing. Two handsomely spotted rock-cod

were bagged, weighing about 8 lbs. each, and seven deep-keeled fish of 5 to 6 lbs. These are of a lovely Prussian blue, with a pale yellow patch a foot square across the back. Both kinds are excellent to eat.

The camels were given water for the first time since leaving Oqair. On resuming the march we soon left the higher headland of gypsum and crossed a succession of coral sand bays and sand-dune headlands. Once more a party of migrating swifts, chimney swallows, and tawny pipits were noted, while an exhausted white wagtail was caught on the baghala. Our objective was a headland which was visible to our southward. Ahmad at first said this was the elusive Hashm Husaini, but on arrival altered it to Huwaiqil (pronounced Hawaijil). Every time he corrected the name of his landmarks it necessitated altering all my notes and observations.

The baghala anchored for the night on the south side of the headland Huwaiqil, a quarter of a mile from the shore in the deepest water so far met with on the journey. The little boat came up on to the sandy shore for the first and only time. This bay is renowned in Bahrain for its firewood, deep water, and shelter from a northerly gale. Dwarf tamarisk (Arabic *turfa*) grows here among the rounded sugar-loaf mounds of light sand and gives a peculiar pin-cushion effect to the landscape. I caught two Agama. When held in the hand they assume brilliant colours; the throat goes purple, the body and head azure blue, and the tail vermilion, but this all fades in spirit to the normal sandy colour.

The camel party tasted fish here for the first time, having first refused the present of an uncooked cod, saying they would prefer to eat a snake. Apparently, never having seen fish, they were unaware whether in the strict interpretation of the Koran it would be forbidden or allowed. Ahmad then presented them with a bowl of cooked fish when they arrived hungry. After an argument Muhammad Hassan started cautiously, and soon the whole of the Ikhwan were chancing their hopes of salvation. On subsequent days they never ceased to ask for more fish.

Reaching Hashm Husaini had become a standing joke among the men, but Ahmad promised that we should see it without fail on the morrow. At 6 a.m. on April 2 there was a fresh wind from the north and the sky was completely overcast, but the temperature was 78°. Hashm Husaini was definitely located a few miles inland. It is a bluff at the end of a sandstone range, rising to about 300 feet above sea. It certainly bears a strong resemblance to a fox's nose, as its name implies, and is a good landmark by land and sea. Our general course was as before south-south-east. We passed a succession of bays varied by a small inland sea with a narrow inlet, which Ahmad said was Dohat Hamar. After this the bays gave way to a stretch of straight coast, and our evening anchorage was exposed to the north wind. There was only 4 feet of water half a mile from the shore, and as our baghala ate 4 feet—as

Ahmad puts it—he could sail no nearer. Even the rowing boat stuck 200 yards out in a foot of water. We were tossing all night in the swell, and the baghala seemed to be turning somersaults at the end of the anchor rope.

We had passed during the day a small caravan of Badawin with one donkey, two camels, and a few sheep, travelling northwards; they kept well away to our westward, and doubtless were watching us as closely as our camel party watched them. They were said to be on the Hasa–Qatar caravan route. Some fresh species of birds were noted, doubtless all migrants: Red-throated Pipit in breeding plumage, Yellow Wagtails, Crag Martins (*Ptionoprogne rupestris*), Chiff chaff, and Sand martins; and we moved two hares.

On April 3 the north wind had dropped slightly, but the boat was still rolling, and I was glad to get ashore. There was still enough cloud to set me wondering what chance there would be of getting sun observations at Salwa, which was estimated at three hours' march from our camp. On passing the first headland Muhammad Asahali pointed to some blurred objects on the horizon which he said were the palm trees of Salwa. To our westward were numerous hills and ranges of about 300 feet, to which Ahmad gave the general name of Jabal Skhul, which was confirmed by the camel party. I had adopted the rule of accepting only names on which both parties had agreed. Between the hills and the sea was a plain 2 or 3 miles wide, through the middle of which ran the Hasa–Qatar caravan route. We came in sight of twenty camels advancing along this line in the direction of Hasa. The party was friendly, engaged in trade with the Hasa. We stopped beside a small clump of wild date palms, the only one on the western shores of the bay, in fact, the only landmark. I took bearings with the compass on several clumps of palms on the eastern shore across the sea, now narrowing down to a sharp angle to our south.

There was no well near the palms, but a hyæna's earth was established in the bushes and very recent footmarks indicated his presence. As the southern apex of the bay was one of the possible estuaries of the Wadi Sahaba, I particularly examined it in passing for fresh-water shells, fossils, or any alluvial formation, but found only coral and marine shells. The plain stretching to the southward meets ranges of hills and valleys at a distance of 4 miles, and has the appearance and general formation of an estuary. On turning northward and eastward we passed from the western to the eastern shore by stepping over the tapering sea, here only a yard wide. We made straight for the first group of palms on the east coast, 300 yards from the sea: bushy palms about 12 feet high, with light sand accumulated round them. A few trees only get away from the rest and grow to shapely trees of 30 feet. There was no indication that even these ever grow fruit. Although most patches have no wells, it is probable fresh water could be found near the surface in any of them, and that their roots are actually in contact with it.

The second knoll of palms was passed on our left, and we headed straight for the third, which was 1½ miles inland where there were four wells. We couched the camels under the shade and prepared to camp.

Muhammad mysteriously led me by the hand to where a few hundred yards on the other side of the trees lay the ruins. They were bigger than I expected from recent reports, but certainly did not suggest the remains of a large town such as Gerra might have been. They proved to be the outline of a spacious castle with rectangular walls 95 yards by 71 yards enclosing a courtyard. The walls were originally 6 feet thick, built of slabs of shell-covered rock, well cemented where protected, but mostly strewn helter-skelter about the base. The tower and inner castle were plainly traceable, the walls being still 4 feet and the tower 12 feet high, but a tumbled mound of loose slabs. A well in the larger courtyard was paved all round with rock, and the sides were cemented masonry in good preservation. A few pieces of pottery, alabaster, and broken shell of an ostrich egg were found, and similar relics were discovered 2 to 3 feet below the surface.

These objects were sent to Dr. Hogarth, who kindly reported on them as follows: "The pottery, porcelain, and glass, including the bits of bangles, all look, so far as they are distinctive at all, like a settlement of Post-Islamic Arabs who had commercial relations with the Persian shore of the Gulf. The settlement might go back to the Kindi epoch, say sixth century A.D., but the stuff looks to me later than that. . . . Your description of the ruins certainly suggests merely a watering place and scala. But of course Gerra may well have been no more than that."

A party of Arabs came in to the wells with twelve camels. Having sold their loads of fat (dihin) in Qatar, they were now on the return journey to Hasa with trade goods. Two were from Anaiza and four from the south. They all joined us for coffee and an exchange of news. Muhammad Asahali does not think much of Qatar people, and expressed his disapproval by taking imaginary dust in his hand and throwing it away.

By camel, Salwa is three days' journey from Qatar and four from Hasa. The wells 6 feet deep are not sweet-smelling, and have a slight incrustation of salt round the sides near the water, but we drank from them freely during our stay without ill effects. No one attempts to keep them clean, and we found a dead seagull in one and a camel's corpse close to another. A short shower of rain fell at 7 p.m. in the evening. A pair of ravens (*Corvus corax laurencii*) were constantly round the camp, and several Bifasciated larks were identified in the neighbourhood.

Both sea and land parties were anxious to depart now Salwa had been reached, but the following day a circular tour of 5 miles' radius had been planned, to see if there were any other outlying ruins nearer the hills.

The temperature at 6.30 a.m. on April 4 was 79°, at 5 p.m. 95°. The

THE BAGHALA OFF SALWA

MASONRY WELL IN COURTYARD OF SALWA CASTLE

RUINED TOWER AT CORNER OF SALWA CASTLE

RUINS OF SMALLER CASTLE AT SALWA

KOPJES ON SANDSTONE RIDGE SOUTH OF SALWA

sea was calm and the sun shone at rising, but when I had intended to get a meridian altitude it was obscured by cloud. The camels arrived on the shore at 7.45 a.m., and we marched eastward along the sea-coast. After a quarter of an hour Muhammad called, " Look, another castle." We had stumbled on a small square ruin, of much the same slabs of rock as the larger one, which from here lay 1½ miles inland at a bearing of 172°. They are probably of the same period, the smaller being a coastal defence post. The camels were couched for a closer examination, and we discovered a few pieces of broken pottery and bracelet.

My expectations of finding the remains of a large city were now rising. We went a little further along the coast. At 3 miles from our starting-point we turned inland on a course due south, crossed the Qatar–Salwa caravan track, and struck across a white sandy plain towards a range of yellow sandstone hills that run 3 miles south of Salwa wells. A rough estimate of their height is 300 feet. We stopped in another small oasis of wild palms at their northern base to brew coffee and make observations. The men have gradually become accustomed to the instruments, and have all looked through the theodolite and prismatic compass and say they prefer the field glasses. I have explained that the former has been brought especially to discover ruins. On resuming the march a silvery fox was roused from some palm bushes and was gone before rifles could be snatched from the saddle-bags. We returned to Salwa wells without any further discoveries.

The wind had been blowing from the south, which was favourable for Bahrain, and Ahmad continually worried to be making a start. Food and water were getting scarce, and he did not want to fill his tanks from these wells. It was necessary to arrange to depart the following day, whether I had been able to observe the sun or not, but for the sake of peace I told him to go on at once and leave me behind, which had the desired effect. At 1 p.m. the sun appeared, and we returned to the boat to get out the theodolite. There was scarcely time to take two readings when the sun clouded over for the rest of the day. Having brought two heavy instruments all that distance, and hired a boat especially for their conveyance, it was maddening. Even a complete round of angles to various points was defeated by mirage and refraction. Having marked the site of the theodolite we returned to the baghala for the night. A hot evening followed and a dead calm.

Salem had borrowed my twelve-bore to lie up for a bird he called a " Kurwan," which came regularly to drink at one of the wells. They now brought it to me, and it proved to be a pale race of Norfolk Plover, which they also named " Ibn Houbara " (son of a bustard).

On April 5, at 7.30 a.m. we went ashore and took observations for azimuth, longitude, and time with the theodolite, but any idea of staying for an afternoon set had to be abandoned. At eleven the camel party came to say farewell and departed direct for Hufuf. At noon up went

the sail, and although the fates had sent a northerly wind we were able to tack against it towards Qatar, keeping a course parallel with the coast about a quarter of a mile from the shore. This and many subsequent tacks enabled me to gain a good idea of the features of the eastern side of the bay.

At first the shore is low with sandhills in the background, but further north the hills and shore meet, and continue to run up northwards in close proximity. The depth of the sea is not great anywhere.

At dawn, where the baghala had been anchored a quarter of a mile from the Salwa shore we found ourselves only just afloat with barely 4 feet of water. She had to be poled into deeper water guided by a man walking in front on the sea bottom. After sailing a mile we were in 12 feet of water. A boat drawing more than 4 feet should not approach Salwa wells, but should keep towards the Qatar coast, that is to the eastward of the centre of Dohat Salwa. On the return passage we saw again and roughly checked the positions of the hills and headlands located on the journey down. Hashm Husaini, although actually the third range of hills northward from Salwa, is the first-named hill.

At 3 p.m. we were caught on the Qatar side by a high north wind, the dreaded "schmaal." The boat sped before the gale looking for a sheltered bay, but the Qatar coast seemed here to be quite straight; it certainly was wherever we saw it during the next two days. The anchor was cast a little way out at sea to weather out the storm. Ahmad did not know this coast and says it has never been surveyed. We hoped the wind would abate at sundown, but it blew hard all night. It was wonderful to see Ahmad standing erect to say the "Call to prayer" while the boat was at all angles.

Next day the wind had subsided sufficiently to allow us to leave our anchorage, and till sunset we crossed and recrossed the sea, finally anchoring for the night close up to the northern shore of Dohat Huwaiqil, where we had camped on our journey down. We had here the deepest water we found. Ahmad estimated it at 20 feet, and I could not see or touch the bottom with a pole. The place was also well sheltered from the north, but the wind dropped completely soon after the sail had been lowered.

We had during the day passed within a quarter of a mile south of Anaibar Island. It is about an acre in extent, composed of yellow-white sandstone, bare of vegetation, and about 8 feet above sea-level in the centre. It was covered with Socotra Cormorants, and the fishy smell of the birds was in evidence at a distance of half a mile. At a point a quarter of a mile to the south-west of the island is a rock about a foot under water, over which the waves were breaking as we passed. I took a reading of 40° when the rock and island came in line.

Here the Qatar coast is a sandy shore; scrub grows close to the sea and across 1 to 2 miles of undulating sand-dunes until the hills are reached,

which appear featureless and level topped, running parallel with the coast and rising to 200 to 300 feet. Dohat Salwa is about 8 miles wide, and from the middle both coasts were plainly visible.

April 7 found us lying becalmed in Dohat Huwaiqil. The sail had been raised at 3 a.m. to catch a small breeze which arose, but it had been hanging limply ever since. By the afternoon we had drifted about halfway between Umm Uwaidh and the Qatar coast. The sea seemed still not much more than 8 miles wide. Occasionally the lazy flop of a porpoise broke the silence out at sea. Once a shoal of small feeding fish swirled up the water and attracted some terns apparently from nowhere, but they kept just out of reach of my gun. Beyond these some Slender-billed gulls (*Larus gelastes*) were the only living things seen during the day.

At 5 p.m. we began to move with an east wind, and at six this was still blowing and we were running northwards up the middle of the sea. Zakhuniya Island was passed out of sight at twilight, and we were expecting to be in Bahrain early the following morning. The crew were in excellent spirits at the altered prospects. At 10.30 p.m. I was lying on my blankets looking at the Great Bear and thinking things might be worse, while the boat was cleaving the waves as she bounded along. There was a cry of land ahead, and the sail was fetched down helter-skelter. Ahmad did not exactly know where he was, but thought it was Ras al Bahr, the southern point of Bahrain Island. He would not risk any further sailing in the dark, and we lay-to at anchor to await dawn.

Daylight showed that we had been heading straight for Ras al Bahr, and had only just discovered it in time. It is a low sandy headland fading by a gradual slope southwards into the sea. Luckily the east wind was still blowing and enabled us to continue a course up the west coast, and later by tacking along the northern coast the jetty at Menama in Bahrain harbour was reached that afternoon.

THE TEDI RIVER DISTRICT OF PAPUA

Leo Austen, Assistant Resident Magistrate, Western Division, Papua

ON the map of Papua the Tedi river will be found under the name of the Alice River, which meets the Fly River near Morehead Island about 460 miles above its mouth.

In 1875 the Rev. Samuel Macfarlane, of the London Missionary Society, ascended the Fly River a distance of 160 miles on the look-out for a site on which to build a mission station. With him as his guests he had the Police Magistrate from Cape York, Mr. Chester, and the Italian naturalist, Signor D'Albertis. This trip so fired the enthusiasm

of D'Albertis that the following year the Italian obtained the loan of a vessel from the New South Wales Government, and set out to explore this large and unknown river still further.

On his second trip D'Albertis ascended the Fly River to some distance above Morehead Island, and it was on this journey that he discovered and named the Alice River. As far as I can remember, D'Albertis did not proceed up the Alice River any distance, and when Sir William Macgregor explored the Upper Fly River in 1890 he also continued along the main river, considering the tributary of much less importance.

It was not until April 1914 that a vessel proceeded to explore the Alice, when H.E. Judge Murray, the Lieutenant-Governor of Papua, ascended it in the *Elevala* and made a traverse as far as she was able to steam, viz. 35 miles above the junction with the Fly River. His Excellency found that the course of the river had changed since the visit of D'Albertis and Macgregor, for on the traverse that was made in 1914 the Alice is shown as meeting the Fly on the western side of Morehead Island, instead of on the eastern side, as had been shown on Macgregor's map of 1890.

Judge Murray states in the Papuan Annual Report for 1913–14 that he saw no villages along the Alice River, and the only village of high houses he had found in occupation was near the banks of the Fly River, some miles below Morehead Island. I think that this is to be accounted for by the fact that the people who build these high houses in the Upper Fly River district are primarily bushmen, and only an odd village is erected close to a river-bank. Fishing and sago shelters certainly are made along the banks of rivers, but these are occupied for only a few months during the year. As a rule the main villages seem to be built not less than 4 miles away from a river. Possibly this is done for defence, or because better garden land is available inland from the river. It is known that the Tedi people are raided by the head-hunters of the Fly River, and fear them just the same as the bush people of the Morehead feared the Tugeri in years gone by.

The village of high houses Judge Murray visited near the Fly River is called Muruwara, and belongs to the Tedi people. At the present time it is deserted, for what reason I have been unable to ascertain, and there has been no other village near the river built in its place, so it is possible that the inhabitants have gone further into the bush.

In 1920, when Mr. Lyons, then Resident Magistrate at Daru, and I went up the Fly River in search of two white men who had come overland from Dutch New Guinea, we were fortunate in having the loan of the services of a Muiu river boy as an interpreter, and it was through him that we first learned of a supposed large population round the Alice. Mr. Keyzer, the Dutch Controleur at Assike (D.N.G.), also stated that he had heard that there were numerous villages near the Alice, and to the north of it. On his map which he afterwards presented to us, I

noticed a range of mountains marked " Sterren Gebergte," which seemed to follow the boundary between Papua and late German New Guinea. Who fixed the positions of the various peaks marked on the map, I am unable to say, but I fancy it was done from the headwaters of the Kaiserin Augusta River in the Mandated Territory. I have translated the Dutch name into " Star Mountains," and as most of the peaks named by this unknown explorer are called after stars and constellations, I think the translation should stand.*

On our return to Daru in the end of 1920, the Lieutenant-Governor decided to send an expedition to the Alice River to explore the country surrounding it. In 1922 arrangements for the expedition were completed, and I was placed in charge of it. My party consisted of Patrol-Officer Logan, 12 armed native constables, and a Malay interpreter, with 35 native carriers taken for the overland trip. The Government auxiliary ketch *Nivani* of 25 tons took our party to the Alice River. It was navigated by Engineer-Officer Waldron and four natives. We left Daru on January 12 and returned on 5 April 1922.

On our way up the Fly River we stopped at the 1920 No. 1 Dutch Camp—now called Riverina—and hence I went inland to the Oewimmerah river, and down to Assike by raft to obtain an interpreter from the Muiu river, who I thought would be useful to speak to the Alice River people. The Dutch Controleur at Assike assisted my party in every way, and lent me two interpreters.

After my return to Riverina I continued to the Alice. At first we had difficulty in locating the Alice from the old charts we had with us, and it was only after circumnavigating Morehead Island in a whaleboat, that we found that the course of the river had changed and that it now entered the Fly River at the western end of Morehead Island.

We continued up the Alice about 37 miles, and anchored about a mile above two islands which I have named Waldron and Logan islands. From here our journey was overland, and it was on this part of the trip that most of my notes were obtained. Though interpretation was not of the best, the two interpreters from the Muiu river helped us materially in making friends with the tribes living on the western bank of the Alice—or, as it is locally known, the Tedi river. The people on the eastern side were more difficult to make friends with, but as we did everything possible to make them understand we had come on friendly business, and wherever the people ran away we left presents in their houses, the next party to go into these parts should have a more friendly reception. The people are not warlike at all—far from it—but seeing a white man for the first time was too much for them, especially as we had a big party with us.

* The Dutch map referred to here is presumably the Schetskaart van Nieuw Guinee (Nederlandsch Gebied) 1 : 1,000,000, 1919, in 4 sheets, published by the Topographische Inrichting, Batavia.—Ed. *G.J.*

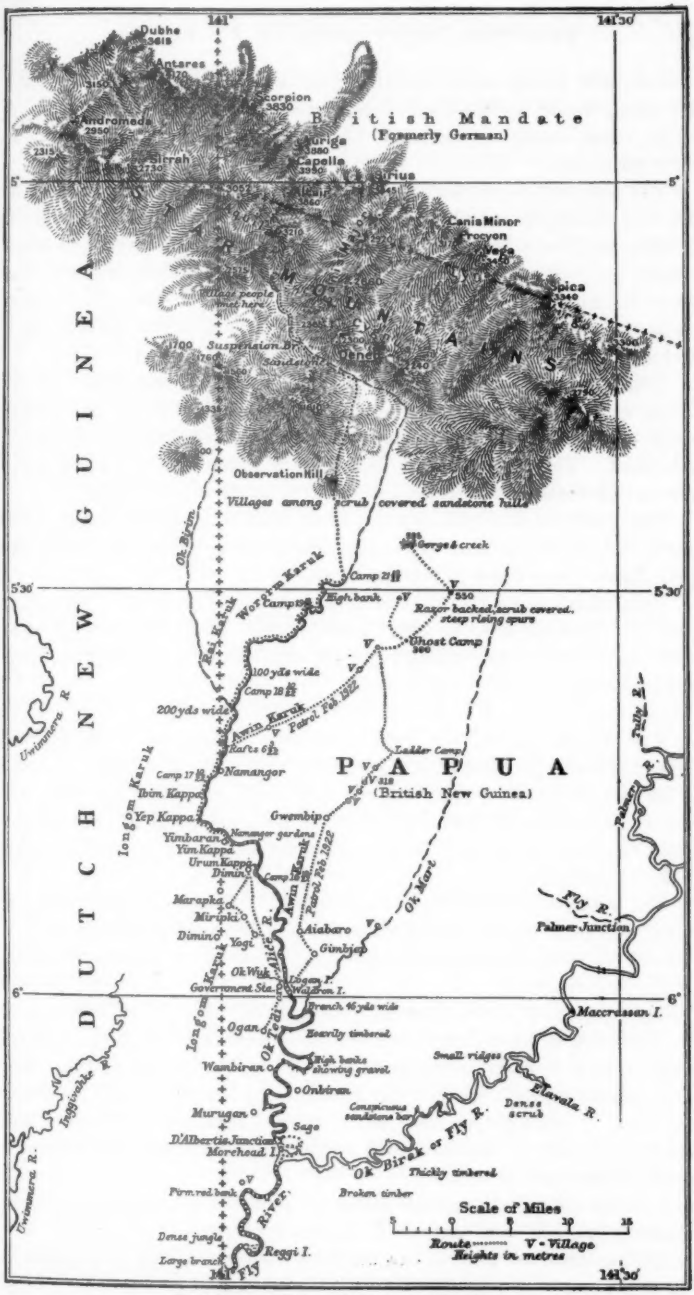
Though the languages of the western and eastern Tedi peoples differed materially, their customs and habits were so similar that I have embodied them in one set of notes. But the similarity was by observation, and when good interpreters are available for the eastern and western tribes, and our knowledge of both enlarged, marked differences may be found. Unless I say otherwise, the language referred to in these notes is from the western Tedi tribes.

The Upper Fly River is known to the people living near the banks of the Alice River as Ok Birak (Ok meaning " river "). The Alice River is locally known as the Ok Tedi; the Ok Birim is a tributary of the upper Tedi, and flows from the Star Mountains near the border of Dutch New Guinea and Papua, at first south-west, then south-east until it meets the Tedi somewhere between 5° 30′ and 5° 45′ S.

Both the Tedi and its eastern tributary, the Ok Mart, rise in these mountains, the latter flowing first south-east and then south-west, and meeting the Tedi a few miles south of 6° S. The general direction of the Tedi river is due north and south. A small stream called the Ok Wuk meets the main river on the western side, a little to the north of Or Ambip village. From information obtained it seems that this branch is about 20 to 30 yards wide at the junction. On the Ok Wuk lies the village of Marapka where live the two boys, Atug and Kuwat, who came back to Daru with me. Innumerable fast but small streams drain the Star Mountains and flow into the Tedi and its tributaries. As far as I can judge, the only other river of any size that may rise in the Star Mountains of Papua is the Fly River proper, which meets the Palmer River at Palmer Junction.

The banks of the Tedi from Morehead Island to about 6° S., and also some distance to the north, are mostly low-lying, with here and there a high red clay or sandstone bank, backed apparently by highland. On many of the high banks we saw native gardens. Beyond 6° S. the country inland from the river is very hilly and gradually rises as one goes north. On the east of the Tedi, the highest mountains are near the border of Papua and the territory of New Guinea. Our highest point reached was only 1950 feet above sea-level. We were unable to reach the high peaks owing to the scarcity of native food in the hills. After leaving the Mart, the country inland seems to be formed of undulating sandstone ridges. The soil on these hills looks to be a mixture of red clay and sand, and is apparently well suited for growing the few varieties of garden produce that the natives plant.

The Tedi is navigable as far as the Ok Mart at most times of the year, for boats drawing not more than 6 feet. When the river is in flood the vessel would be able to go as far as the first two islands. But from these islands northwards only very shallow-draught power boats could be used. The Mart is navigable only for boats drawing 3 or 4 feet. I consider


141°
141°30'
5°
5°30'
6°
Dubhe
Antares
Scorpion
Andromeda
Sirrah
Capella
British Mandate
(Formerly German)
Spurius
Canis Minor
Procyon
Vega
Spica
Observation Hill
Villages among scrub covered sandstone hills
Ok Bram
Camp 21
Camp 20
High bank
Ghost Camp
Razor backed scrub covered, steep rising spur
Gorge & creek
100 yds wide
200 yds wide
Camp 18
Camp 17
Namangor
Ibim Kappa
Yep Kappa
Yimbaran
Yim Kappa
Urum Kappa
Dimin
Marapka
Miripki
Dimin
Yogi
Ok Wak
Government Sta.
Ogan
Wambiran
Onbiran
Murugan
Sage
D'Albertis Junction
Morehead R.
Firm red bank
Dense jungle
Large branch
Reggi I.
Ok Tedi
Ok Mart
Ok Birak or Fly R.
Ok Mani
Ok Kasuk
Ok Wok
Ok Tedi
Ok Ogan
Ok Ogan
Ok Ogan

that a small launch with a good engine, and towing a whaleboat or a flat punt, would be the ideal thing for exploration in these parts. A larger vessel, except in the main Fly River, would be useless owing to the rapids.

The hills are forest-clad and contain many large timber trees 80 to 100 feet in height at least, but not more than 4 to 5 feet in diameter. Rattans and many varieties of palms, especially the *gore* and *gamuamu* (Kiwai language), grow on the hills. The pith of the last is edible, and when boiled makes a very good substitute for vegetables. It can also be eaten raw. North of lat. 5° 30′ S. very little sago was found inland, and what was growing in the valleys was poor and stunted.

Along the banks of the rivers the thick virgin forest grows almost to the water's edge, all the trees being covered with creepers and jungle vines. On most of the gravel and sand banks the wild type of sugar-cane flourished. This cane has no pith, and is filled with a watery juice. Where old clearings had been, breadfruit trees grew prolifically.

The banks of the Tedi and the Mart were noticeably different; the latter had ferns, mosses, and other shade-loving plants wherever the stone banks came down to the water's edge.

Pigs, cassowaries, cuscus, and scrub wallaby were seen, while goura and blue pigeons were in abundance. Many Birds of Paradise were heard, and seen in the distance, but not close enough to determine their species.

The people west of the Tedi river have a language quite distinct from that of the people on the east. But the customs and habits of both, as far as they could be observed, are very similar. The tribes along the western bank and north to the Ok Birim, and perhaps as far west as the Disul river in Dutch New Guinea, all speak a similar language but with dialectic variations.

The western Tedi have their outlet to the Fly River between Morehead Island and Bluff Point. A few miles south of this point lies the boundary of the Tedi people and the Birak or Upper Fly River tribes called Chirik by the western Tedi.

Tracks of people were seen on the Fly River near the old opening of the Tedi or Alice River, but we did not come in contact with them. Those people would, I imagine, belong to the Eastern Tedi tribes, and possibly their country extends between the Tedi and the Fly River, above Palmer Junction. I could get no information as to the names of the tribes and whether they are divided into clans or groups and whether they are totemistic in their beliefs.

I do not think I am overestimating the population between the Dutch boundary (141° E.) and 141° 30′ E. at 2000; probably it is more.

During the whole patrol I saw only one woman, and that at a distance. She appeared to be much smaller than the average man, and wore a very

short rami or petticoat of grass about a foot wide. This rami is called *wunum*. On her head seemed to be a netted hood, which she appeared to take off as she was running away.

Mr. P. O. Logan saw several women who came to say good-bye to the two Tedi boys who were going to Daru with us. One old lady's face was painted on the forehead, cheeks, and chin with red clay, and several younger girls with yellow clay. They all wore the short rami. The hair was cut very short. The breasts of the younger girls, who were the intended wives of the two boys, were painted with a yellow circle, the nipple being left clear. No ornaments were worn except the large netted bag. The old woman had the first finger of the left hand cut off at the second joint. The women were much smaller than the men.

The men, generally speaking, were about the same colour as our Northern Division police, but several were seen much lighter in colour than our cook boy from Delena, near Yule Island.

The natives from the Birim river were much shorter than those living along the Tedi. In physique the Tedi natives were sturdy and fairly well built—rather different from the bushmen one meets south of the Fly River. Their hair was kept short and was woolly. The unmarried men who were looking for wives plaited long ringlets of split cane or sago leaf into the hair. The younger boys and the older men and those who were married did not do so. One single man had his plaited ringlets drawn up into two bunches, plastered with some kind of glue, and then painted red, making them look like two immense carrots about 12 inches long.

The lobe of the ear, sometimes the right and sometimes the left, was distended by means of a node of bamboo (*kenowet*) to a diameter of 1½ inches. Both wings of the nose were generally perforated, and birds' spines or thin pieces of reedy grass were stuck in them. Through the septum of the nose bamboo or bone was inserted, and the two boys we had with us wore a piece of bamboo through the nose about half an inch in diameter. The upper lip is sometimes shaved. No tattooing or raised scars were noticed. As far as could be ascertained circumcision is not practised.

Though most of our friends used a grass covering for the posterior many of them did not wear it. This article is made from sago leaf. In the elderly men this grass tail was exaggerated into a rami, being a series of thin grass tails plaited into a waistband. Both these kinds of posterior covering go by the name of *mukat*.

Besides the above, these natives adorn themselves with a band of plaited fibre about 2 inches wide in which are sewn "Job's tears" (? *Coix tubulosa*). This is called *itorp*, and is worn on the front of the hair just above the forehead, and is tied under the back of the neck. Round the forehead a piece of pigskin is sometimes worn. This is a strip of pigskin about ¼ inch wide and about 9 inches long. The centre

of the skin is diamond shaped. It is called *awongat* (lit. " pig's skin "). Several men were noticed in the various villages, wearing a piece of rattan in the nose, in place of the bamboo. This was cut to represent two segments of a circle parallel to each other. The name of this ornament is *korormdang*. In the ear the *kenowet* aforementioned is used, and it is painted on the inside with white clay. Circles of cassowary spines are also worn in the ear. Plaited fibre arm, neck, and waist bands are worn, and all are called *yet*. Sometimes twisted rattan is used as arm and neck bands. It is known as *beri ik*. A long strip of split rattan, from one of the large varieties, is ornamented and twisted round the waist. This belt goes by the name of *kombeknong*. Across the shoulders and over the chest, plaited string called *nim* is worn. Dogs' teeth necklaces (*butak*) and necklaces of pigs' tusks (*awon-ningambo*) are often used as adornments, and a waist band of dogs' teeth, that was most highly prized by the owner, was seen on a Birim river man. *Yet* (plaited fibre circles) are worn also on the legs below the knee. Except those who had lately been dancing, none of the men were plastered with mud or clay. In the villages that were visited, nothing in the shape of a combined hood and cloak was seen.

The houses on both sides of the Tedi were alike, in the main, though here and there slight differences were found. As typical, let me describe one of the houses at Gwembip. The main posts of the house were three trees from which the upper branches and part of the trunk had been chopped off 50 to 60 feet from the ground. These trees are sometimes used as rests for the ridge poles, but not at Gwembip. The tree posts were not in the centre of the house, and they came level with the sloping roof. The rest of the posts or piles, usually about 45 to 50 feet high, are placed in holes dug in the ground. These piles are not more than 5 to 6 inches in diameter, so were it not for the trees which are used as the main posts supporting the house, it would easily be blown down by a heavy wind. Even so it is rickety, and when one walks along the floor the whole house shakes. Strengthening posts are sometimes placed from one corner of the house to the opposite corner in the ground.

When the posts are in position it appears that a scaffolding is erected 6 to 8 feet from where the floor is to be laid, and on this the housebuilders work. First, strong bearers are placed lengthways and crossways and tied to the piles. On these a series of small saplings are tied to the bearers, all lying one way. On this are laid similar saplings, but crossways. Then finally the flooring proper is tied on, of palm split into inch widths. Holes are left in the floor from which are suspended fireplaces of saplings covered to a depth of a foot or so with mud. The fireplaces as a rule do not come level with the floor, but are at least 6 inches below it. There is also a hole of about 3 or 4 feet square left at one end of the house, through which comes the women's stairway. A door for this

latter opening is made of a stout sapling on which are tied smaller ones at right angles. Split rattan is closely interlaced among the small pieces of saplings, and the whole forms a strong meshwork door.

The walls of the house are usually of sago midrib, split into narrow lengths. The roof is made of sago leaves in the usual style, except that the ridge of the roof, instead of meeting in the centre and having a capping of further leaves, has one side overlapping about 2 feet. It appears to be the north-west side that is always the longest.

As a general rule there are two ladders to a house, one underneath the house leading up through the hole in the flooring, and the other outside the house at the opposite end, which leads up to a small platform outside a small door in the wall. The former stairway is for the use of the women, the latter for the men.

Houses are always built on hilltops where it is possible, and the surrounding trees down to the valley below are cut down and left to rot on the ground. Garden and hunting shelters are built about 2 or 4 feet above the level of the ground, and both have the suspended fireplaces. The immediate surroundings of the houses are kept scrupulously clean.

Houses are occupied until the supports become too rotten, when the village removes to another hill and erects a new one, surrounding the sloping sides of the hill with their gardens.

Tree houses were seen in several villages, and apparently are used only as look-outs. The structure is similar to the village house except the floor is built among the branches, and only one tree supports the whole house. The ones we saw would be 80 to 100 feet from the ground.

I witnessed the process of firemaking on the eastern side of the Tedi; the same practice is followed on the western side. The names mentioned are eastern Tedi.

First, the man secured some dry pandanus leaves (*kor*), which he crumpled into a mass of fibre. Then he split a piece of a dry stick called *kwo*, inserted a small piece in the split, and bound the two together. The *kor* was then laid on a large dry leaf on the ground and the *kwo* stick on top of it. A piece of rattan (*tike*) was placed under the large stick and between the small stick and the end of the split. The man then put his two feet on the stick, one at each end, and taking an end of the rattan in each hand pulled it backwards and forwards very sharply, exerting his strength in keeping the rattan very taut all the time. In a few seconds the *kor* was smoking, and by blowing on this he obtained a red-hot burning mass.

Sago (*om*) and bananas (*yium*) appear to be the staple food of the people living near the lower Tedi, while in the mountains, from what we observed in their gardens, bananas and pandanus form the chief diet. Sago is cooked in various ways, either in sago leaves, roasted in lumps on the fire, or in internodes of bamboo. Sago is also stored to a small

extent by roasting on hot stones until it forms very hard bricks. The bananas grown seem to be mostly plantains, and are cooked in the skins on the fire or on hot stones. Stones for cooking were in all the villages, but no cooking utensils of any description were seen.

Large lengths of bamboo formed the storage for water in the houses, and nothing in the shape of a water-bottle was found. Dishes made from the spathe of a palm are used. The native name for the dish is *yambat*. Mussel shells are used as scrapers, and pieces of flint serve the same purpose. Calabashes are used as lime pots and are undecorated.

Stone tomahawks (*da*) are the rule, though knives and axes of Malay origin were to be seen. These latter, which were very poorly made, were possibly procured from the bird-hunters who often visit that country. The stone in the tomahawk seems to be porphyritic, and is obtained from the Muiu river tribes. It fits into a socket in an L-shaped handle (*igaṗ*) formed of some springy wood. A stone tomahawk, but of different make, is used to cut out the pith of the sago tree.

The tribes on both sides of the Tedi quite openly admitted the practice of eating human flesh, but they state it is only an enemy that is killed in war that is eaten. They never drink the blood of a human being.

Betel nut of the small variety is universally chewed with lime. Gamada of a large kind was seen growing in one shady spot, but no information on the subject of gamada drinking could be obtained through our interpreters. I think the name for gamada is *yam*, but I am not absolutely certain.

Native tobacco (*a-uṗ*) is grown, but not to the same extent it is along the Upper Fly River. The pipe used is very primitive and resembles a large cigarette-holder more than a pipe. It has probably been introduced through Dutch New Guinea.

The bow and arrow is used universally, but both compare unfavourably in workmanship with those obtained in the Fly district and along the Morehead River. It may be that these tribes are not a warring race and so have not developed the art to the extent of other western tribes. Arrows at ordinary times are carried in a bundle in the hand. The bow is separate from the arrows, so as to be used quickly if required. Cane gauntlets of strong strips of bamboo around which is intertwined rattan, are worn on either the left or the right wrist.

The clubs seen were made of stone, some disc-shaped (*dum*) seemed to be of diorite, while others were egg shaped (*iuƀ*), and these were possibly made of quartz. In the *dum* the handle fits tightly into the hole in the centre of the stone, and in the *iuƀ* the handle is fitted in with a cement of resins and gums. The *iuƀ* are the more valuable, as they take several months to make, for the hole through the centre is drilled with pieces of bamboo. No spears of any description were seen.

Besides the cane gauntlets, a curious article is used by these people that does not seem to be found in Papua south of Muruwara: the

cuirass of rattan, locally known as *irim*. This is a piece of body armour for protecting both back and front of the trunk. H.E. Judge Murray, who obtained some from Muruwara, describes them in the Papuan Annual Report for 1913–14. The cuirass is also worn by the Muiu river (Dutch New Guinea) natives, and I think it will be found that it is used throughout the Star Mountain District. The natives along the Fly River below Bamboo Creek do not seem to know it.

Very little was learned about their methods of hunting or fishing. It was, however, found out that a charm called *nongiwi* is often worn to bring success at hunting. The plant known to the Kiwai as *sadi* is used by the Tedi people for stupefying fish in the creeks. Here it is locally known as *enong*. Another poison used for the same purpose is the crushed bark of the *wun* tree. Where the latter was seen, it was noticed that the natives had dammed the creek to a height of about 5 feet in order to make it flow more slowly, so that the juice in the bark might have a stronger effect. Fish arrows of four prongs were found in practically all the houses visited, and fish nets of string, possibly for catching small crayfish, were hanging up in the women's portion of the houses. The type of fish trap used is similar to that of the Lower Fly River districts, and is of a conical shape with thorny projections on the inside on which the fish are spiked. Fish traps were also made by fencing in a narrow creek while it was in flood, so that when the water went down the fish were unable to get past it into the larger stream

The natives on both banks of the Tedi and among the Star Mountains as far as I travelled, had the same type of garden, usually on the slope of a hill. The cultivation seems very primitive. The dense timber on the hill-side and down at the bottom is chopped and allowed to rot on the ground where it has fallen. It is never burnt off, for we passed through many gardens in our travels that were in various stages of cultivation. It may be that originally their gardens were made only where the whole village lived, and the fallen trees acted as a defence. Now, however, gardens are made on other hills away from the village as well as round the village itself. Or again, it may be that the people have found that the decayed leaves from the fallen timber form a better manure than ash. None of the gardens were fenced.

The villages near the Tedi river have one or two canoes each, but though they are more or less of the Upper Fly River type, they are not nearly so well made, for these people are primarily bushmen.

I never saw a properly made paddle; they use a stick, 4 to 5 feet long, with a piece of bark about a foot square in one end. Rafts of very crude designs were seen here and there, but whether the natives themselves had built them, or whether they had been made for the use of Malay bird-hunters, I am unable to say.

The tracks, 4 to 6 feet broad, that lead from village to village or to their gardens are well made, when compared with the usual path one

walks along in the Western Division. Bridges were made of fallen logs, usually one large log. No suspension bridges were seen.

The numbers from one to five are counted on the fingers of the left hand, beginning with the little finger. Six to ten are shown by marking various portions of the body. I do not think they count further.

Friends meeting after an interval hook fingers by placing the first finger of the right hand of one in between the first and second fingers of the right hand of the other. Then the fingers are pulled sharply apart, making a clicking sound. When friends are leaving one another, they call out *au ior*, which is equivalent to our " good-bye."

After our return to Daru in April 1922, the Lieut.-Governor informed me that another expedition would be sent up to the Tedi, in order to return the Tedi river boy I had brought down, to consolidate the Government influence in these parts, and explore the Star Mountains. Eventually on August 19 Mr. Logan and myself left Daru for the Tedi, and on arrival there we erected a camp on ground called by the local natives Wukpit, which is 34 miles up the Tedi river above D'Albertis Junction.

Part of the first two months was spent clearing the ground, and erecting buildings to accommodate ourselves and our fourteen armed Native Police and thirty-five Lower Fly River carriers. When a strong log cabin had been completed for our stores and sleeping quarters, I patrolled the neighbouring country, visiting all those villages in British territory on the western side of the Tedi between the Fly River and the junction of the Birim river with that of the Tedi.

Having now explored the whole country to the east and west of the Tedi as far north as Birim Junction (locally called Birimkapa), I decided to turn my attention to the Star Mountains, the foothills of which I had reached on the previous expedition. I had, unfortunately, to leave Mr. Logan behind at Wukpit camp to look after the sick, but good came of this, for he was able to make friends with the numerous visitors who came from the district below Birim Junction and from both sides of the river. Much good work in the consolidation of Government influence in the lower parts of the Tedi was due to Mr. Logan, and he had a far more monotonous time than I.

On October 16 I left Wukpit with eight Native Police and eighteen of my carriers. We proceeded along the Tedi in canoe-rafts as far as it was possible to fight against the current. After leaving the rafts we walked overland to the Star Mountains and reached within a few miles of the source of the Tedi river.

The country was mountainous, mostly sandstone, and many dangerous cliffs had to be negotiated along the banks of the upper Tedi, or, as it is locally called in the higher regions, the Ok Ti. The outcrops along the Tedi show sandstone and grit, and late Tertiary marine fossils were

obtained from an outcrop of sandy mudstone among the Star Mountains along the river-bank close to a native suspension bridge.

Past Birimkapa the outcrops of sandstone are more frequent, and the cliffs higher. Wherever there was a cliff on one bank, the opposite bank was nearly sure to be low and flat for some hundreds of yards inland. Rapids occur every few hundred yards, and, as on the Sepik river in the Mandated Territory, islands every few miles.

Owing to lack of instruments, no observations could be made to find the height reached in the Star Mountains, but at one point I was able, with the help of a Dutch map, to resect my position, and I do not consider I ascended at any time more than 5000 feet above sea. My plan right through was to keep to the valley of the Tedi. The Star Mountains, as far as they were examined, are sedimentary rocks, probably Tertiary, though practically no volcanic rocks were seen except odd shingle in the river-bed. According to the Dutch map some of the peaks of the Star Mountains rise to over 12,000 feet. I have inserted the heights on my own map from the Dutch.

One day from Observation Hill I had a most wonderful view of the whole range, with Antares (about 14,000 feet) towering up away in the north-west and dominating the whole of the Star Mountains that could be seen. A little to the east in the Mandated Territory Auriga made nearly as brave a show. Almost due north the peak Sirius (about 12,000 feet), the highest of the nearer mountains, stood out boldly, and dwarfed all other mountains to the east.

Among the Star Mountains many small villages were seen on razor-backed ridge tops, near to one another as the crow flies ; but the precipitous country made it difficult to travel quickly from one village to another.

The people of the eastern side of the Tedi are the Awinkaruk (not Awikaruk) ; on the western side as far north as Birimkapa, are the Iongomkaruk. The tribe round the Birim river, but north of the junction, call themselves Kaikaruk ; while those along the Tedi and to the north of Birimkapa are Worŏm. The Worŏm seem to extend as far north as the lower spurs of the Star Mountains, but I was unable to obtain any information as to the name of those living among the mountains to the north of the Ok Ti. All the above mentioned, except the Awin, speak dialects derived from the same root-stock.

Some Iongom and Awin men reached 5 feet 8 inches, though the average of the fully grown did not exceed 5 feet 6 inches, and a few did not exceed 5 feet. But of a dozen fully grown men from the northern Worŏm the majority measured not more than 5 feet, some of them going as low as 4 feet 8 inches. Three of the crowd measured 5 feet 4 inches, and these were the tallest out of twenty. Among the mountains to the north of the Ok Ti, the few I saw appeared to equal the smaller Worŏm. I met a few Kai men, on my way down the Tedi, fully grown, but none more

than 4 feet 10 inches. In the villages of the lower Tedi on both sides, the natives were only as dark as our Northern Division police, and occasionally much lighter. Further north on the western side were more and more of the lighter people, until among the Star Mountains they predominated.

The hair was generally woolly and very dark brown, but several men in the Star Mountains had hair rusty brown, whether natural or artificial I cannot say. No tattooing or raised scars were noticed in the district.

The Awin houses are anything over 30 feet up to 50 feet in height, while the Iongom seldom exceed 30 feet. One or two houses in some of the Iongom villages were over 40 feet high, but they seemed to be exceptional. The Iongom nearly always had only one ladder for men and women, of cross pieces tied to two long poles. An Iongom man told me they left the scaffolding, after the house was finished, that should the flooring ever give way, an unfortunate person falling through would have something to break his fall.

The upper and lower Worōm houses show many differences from the lower Tedi houses. They are never on very high posts ; few were higher than 15 feet above ground. The hip roof had a ridge capping of sago leaves and did not overlap like the lower Tedi ones. The tree stump used as the centre post did not extend above the flooring. All the houses had a platform or verandah along the front, sometimes with a separate roof.

The further north one goes the less sago is seen, and in the Star Mountains, out of what looked to be three fine trees, we got only one kerosene tinful of very poor sago. The mountain people seem to live on sweet potatoes, the red variety of pandanus, bananas, and a variety of uncultivated nuts and roots from the bush. The pandanus is cultivated in large quantities, and as far as I could ascertain is cooked in lengths of bamboo, after which it is capsized into the palm dish, *yambat*. The further north we proceeded, the fewer iron axes were seen, until when we reached our most northerly point the natives, though they had heard of knives and axes, apparently had never used them. Bamboo knives and flint chips take the place of European or Malay-made knives.

Among the Iongom, Awin, and Worōm tribes the bark of the Wun tree was used to stupefy fish, and small stacks of it were seen near many small creeks, even on the upper Tedi. Fish-traps made by fencing the mouth of a creek were also seen in these higher altitudes, but none of the conical-shaped fish-traps (*werep*) were noticed among the Worōm. Fish arrows of six prongs were seen even in the mountain villages near the source of the Tedi. On the Awin side fish arrows of four prongs were found.

Near the Upper Tedi we passed pig-traps made of two rows of small saplings, forming a race, above which were suspended heavier logs, arranged to fall and crush the animal when it entered the trap. Smaller

traps very similar were used for catching the bandicoot. The bait is pandanus fruit.

The people of the western upper Tedi make gardens very similar to those already described, but their gardens on the flat alluvial land along the Tedi were cleaner. They were mostly cleared of trees and brushwood, and were the only ones fenced. They grow more sweet potatoes and taro than the lower Tedi people, who are fortunate in having sago. But though the mountain people have these larger gardens, there seems only enough for their own use, and even a small party like mine could not depend on the village for even two days' food, without leaving the villagers short.

Among the foothills of the Star Mountains, tracks from village to village follow as much as possible the tops of ridges. Where the high mountains begin, the main tracks follow the creeks as much as possible, but wherever the water becomes deep, the track continues up over scarped cliffs and down again to the shingle. Along the Ok Ti, whenever the track left the shingle, the carriers had a most arduous time climbing precipices. Once or twice I tried to avoid them by going further inland, but decided that the native tracks were the best after all.

[*Note by the Editor:* The above has been condensed from two long papers contributed by Mr. Leo Austen. The originals, which contain much detailed observation of interest particularly to anthropologists, will be preserved for reference in the Library, with a number of drawings of weapons and ornaments, and a collection of photographs.]

Note on the Star Mountains.

The Stérren Gebergte, or Star Mountains, first appeared in the Dutch maps (in any detail) as a result of observations made during the ascent of the Digul river and its tributary the Uvimmera, by the Military Detachment under Captain Weijermann in 1913. Although the mountains themselves were not reached, good view points permitted bearings to be taken of the principal peaks, which were set down in a map compiled by Captain Weijermann's colleague, Lieut. Chaillet, on the scale of 1/250,000. A reduction of this to half-scale, with some details and the names of most of the peaks omitted, was given in the *Tijdschrift* of the Royal Netherlands Geographical Society, Vol. 30, 1913 (see also p. 798 of the text of this volume and *Geographical Journal*, vol. 43, 1914, p. 207). The range was shown in greater detail, with added nomenclature, in the map given in the volume summarizing the Military explorations in Dutch New Guinea, 1907–1915, published in 1920 (see also pp. 45, 46 of this volume). The curious device of naming a group of mountains after the principal stars in the sky cannot be accepted as final: at any rate for those peaks which lie in British or Mandated Territory.

RE-MARKING THE AIR ROUTE FROM RAMADI TO LANDING GROUND R

Flying Officer J. J. Lloyd-Williams, R.A.F.

[*Note.*—We are indebted to the Air Ministry for permission to publish this account of the modern technique of Desert communications, extracted from a copy of a report by Flying Officer Lloyd-Williams, which they kindly communicated in February last. It supplements the papers by Mr. Philby and Major Holt published in the *Journal* for October, with map of the air-route and motor-route from Amman to Ramadi.—ED. *G.J.*]

DURING the early part of September I received instructions to consider the possibilities of re-marking permanently the air route track as far as Landing Ground "R." I accordingly submitted a suggestion that a more permanent marking might be obtained by utilizing the Fordson tractor with a plough attachment. Acting upon instructions, I visited Messrs. Cotterell & Grieg (Contractors, Baghdad) and inspected this type of vehicle, and subsequently arranged for a test to be made at Hinaidi for the inspection of Air-Commodore A. E. Borton. The test proved satisfactory.

On 29 September 1922 I was informed that Air-Commodore Borton had decided to adopt this method of marking, and was instructed to prepare a convoy to carry out the work. Four Crossley light tenders were allotted and prepared accordingly for the desert.

No. 1 tender (rations). Chassis raised to increase the sump clearance above the base of the front axle. The body of tender partitioned for the purpose of division of rations.

No. 2 tender (wireless and water). Sump raised and a 90-gallon petrol tank installed to carry water. This was secured into the body of the tender by cable. A tap with a length of rubber tubing was led into the base of this tank for drawing off water. A double pulley was fitted in place of the single fan belt drive pulley, and a Newton generator attached by means of a bracket to the chassis. High-tension leads from this generator were carried into the body of the tender, where a field regulator was placed and the necessary leads and connections made for direct W/T operation from the generator. W/T masts were carried under the seats. On a future occasion I would suggest that probably a better fitting for a W/T generator could be made by utilizing the flywheel of the Crossley tender and operating by means of a clutch or slip pulley, as the arrangement mentioned necessitated the uncoupling of the whittle belt when on the move, and its re-assembly when using the W/T set.

No. 3 tender (Crossley tender spares). Sump raised and a 90-gallon tank installed as in No. 2 tender. Lewis gun fittings to carry the yoke mounting were secured to the sides and rear of the tender. A Rotax

dynamo was fitted to the front chassis and driven in a similar manner to the Newton generator on No. 2 tender. Leads were carried from this dynamo to felt-lined battery boxes in the body, where accumulators were subsequently re-charged on the move. A switchboard with voltmeter, ammeter, and automatic cut-out was arranged between this dynamo and the batteries, and secured on the dashboard. This method of re-charging accumulators proved entirely satisfactory, and has a great advantage over the usual method of carrying an A.B.C. engine with its attendant spares.

No. 4 tender (Fordson tractor and plough spares). This was already a specially altered desert tender, and no alterations were made, with the exception of a Lewis gun mounting and the attachment of a speedometer to the front wheel.

On October 3 I proceeded to Messrs. Cotterell & Grieg, Ltd., and obtained from them the necessary Fordson spares which I had decided on in consultation with their engineer. I had already obtained from them the Fordson tractor with Oliver plough attachment, which was parked at No. 70 Squadron.

On the evening of the 3rd I parked the convoy at No. 70 Squadron under guard, and divided it into two sections: Flying Officer Hall in charge of Nos. 1 and 2 cars, and Flying Officer Oxley-Boyle in charge of Nos. 3 and 4 cars.

On 4 October 1922 the convoy left Hinaidi at dawn. Prior to departure I divided the two sections, instructing Flying Officer Hall with his cars to proceed direct to Ramadi, where he was to arrange for the re-fuelling of water and petrol on my arrival with Flying Officer Oxley-Boyle's section with tractor, and to reconnoitre the car track for a distance of 6 miles, and definitely locate the desert route. I did this, as on the original survey the desert track was not easy to define owing to numerous car tracks around Cavalry Hill leading to the desert from the Hit road. Road bands were fitted to the tractor, and I arrived at Falluja at 13.50 the same day. Beyond the pontoon bridge across the Euphrates the road is deeply covered with a fine white dust, and the tender following the tractor was unable to observe whether all parts of the plough remained intact, with the result that on halting at a distance of 800 yards from the bridge, the portion of the plough which operates the lift of the shares was found to be missing. This was discovered lodged between the interstices of the bridge. An Armenian we met here informed us that the project we had in view was impossible, as he had had considerable experience with this type of tractor and plough, and he considered that the Oliver plough was not suitable for the work suggested, owing to its propensity for strewing its various parts if drawn at a high speed. On the re-assembly of this part, the journey was continued without event. The convoy arrived at Ramadi at 19.15 hours, having covered a distance of 81·5 miles. On my arrival Flying Officer Hall informed me that he

had arrived with his section at 13.20, and that he had definitely located the desert track. I accordingly sent a W/T message to No. 70 Squadron to that effect.

5 October 1922. Convoy remained at Ramadi. During the day I reconnoitred the desert route, verifying the track by compass triangulation on Cavalry Hill and Ramadi. The convoy was re-fuelled and nuts and bolts on the plough burred over to prevent a recurrence of the episode of the previous day. I despatched a W/T message to No. 70 Squadron, informing them of my intention to leave at dawn on the following day. Fresh vegetables were bought in the town before leaving Ramadi for the desert.

6 October 1922. The convoy left Ramadi at dawn and proceeded 2½ miles along the Hit road, where the desert track branches off. The road bands were removed from the tractor, and ploughshares which had previously been carried in the tenders were re-assembled. I instructed Flying Officer Hall to take his section along the car route, and for his second car to keep at the farthest possible distance while remaining in view of myself, and to line in with the leading car and tractor. This method was adopted throughout in straightening out the old track. Ploughing was started at the point where the first line of trenches cuts the telegraph line on the Hit road 2½ miles from Ramadi. Furrows were made 400 yards in length with an interval of 400 yards, and as deep as possible, taking into consideration the nature of the ground to be traversed. On the return journey these furrows were overlapped by corresponding markings which filled in the interval, the overlap being 10 yards distant from the original furrow. After following the plough and tractor on foot for a distance of 6 miles, I arranged flag signals between myself and the native driver, regulating the length of furrow, which I got from my speedometer; at the same time I instructed one of the cars to follow on in the rear of the tractor. The subsoil between this point and the Bitumen Pools is sandy and turns over easily.

At 10.00 hours a Vickers-Vernon of No. 70 Squadron, Pilot Flying Officer H. Seton Broughall, M.C., landed alongside the convoy at a point 4 miles east of Landing Ground 2. He reported the visibility of the track excellent, and very straight. The country between Ramadi and the Bitumen Pools is to all intents and purposes entirely similar and affords innumerable landing grounds.

At 17.30 hours I arrived at the eastern extremity of the Bitumen Pools, cutting away from the original car track to make a more direct line. The car track at this point passes to the north of the Pool, whereas the air route passes directly over it. The plough-marks up to the edge of the pool were doubled to prevent any error by machines which might take the longer route and follow the original car track. Camp was pitched that night on a mud flat due east of the pool, as I considered it possible that the Vickers-Vernon which had proceeded to Landing

THE W/T TENDER IN ACTION

MARKING THE NUMERAL OF LANDING GROUND 8

REFILLING THE DE HAVILLAND TANKS AT EL JIDD

PLOUGHING THE ROUTE

WATERING AT THE WADI RUTBA

Ground 2 might return and could then land alongside me. During the night the wind changed, and the vapour from the bitumen was very disagreeable. Future convoys should camp at least 5 miles to windward if they wish to avoid this. I parked my convoy in a hollow square, leaving an interval at either diagonal for Lewis guns. This method affords the greatest field of fire, as two guns can cover the four sides of a similar camp, so that if an open space is chosen it is practically impossible for an Arab raiding party to attack with impunity. I also carried two dogs, which from personal experience I knew to be of great value, as the Arab raider is prone to creep up at dawn close to a bivouac and then rush. This manœuvre is fairly easy to carry out with the quantity of scrub in the desert, and a single sentry might be surprised and the convoy rushed before it had time to stand to arms, whereas it is impossible if watch-dogs are carried, as they give ample warning of the approach of Arabs. Guards of 45-minute watches were kept, all ranks, including officers, participating.

WATERING AT THE WADI RUTBA

There is undoubtedly fresh water to be found close to the Bitumen Pools, as there are innumerable gazelle and jackal tracks leading on a definite path in a south-easterly direction. The pool itself is fringed with a salt crust, covered by brine water which is useless for all purposes. Distance covered, 28·53 miles.

7 October 1922. Struck camp and left the Pool at dawn with the intention of marking from the western extremity. This at first appears an almost insurmountable task, as the pool itself lies in a hollow, surrounded by very broken country and interspersed by wadi and rock. However, a path was eventually found, and a direct marking was formed on the western boundary, bearings being taken by compass for alignment with that on the eastern boundary. Subsequently on flying over the route the markings were found directly aligned.

PLOUGHING THE ROUTE

The country from this point to the Wadi Muhammadi was difficult to plough, as a large quantity of rock lies along the entire route, and the country being undulating it was difficult to keep alignment except by compass. The Vickers-Vernon landed alongside the track at 09.00 hours, when they again reported visibility excellent, and at the same time suggested that the track over the Wadi Muhammadi could be straightened considerably by cutting across the car route if possible. Ploughing was carried out under difficulties as far as the Wadi owing to the rock outcrop on the hill. On arrival I sent three cars ahead for "lining up," and took the tractor with one car into the Wadi bed, subsequently ploughing completely across it. The Wadi bed consists of large boulders, and an accident nearly occurred by the seat of the tractor collapsing and depositing the driver in the path of the plough. Ploughing was continued hence to Landing Ground 2, where we camped for the night, and carried out minor repairs to the tractor. I went up in the Vickers-Vernon and made a reconnaissance of this portion of the track. W/T message was

sent to No. 70 Squadron reporting progress and position of convoy. Distance covered during that day, 27·83 miles.

8 October 1922. Re-marked the circle at Landing Ground 2 before leaving at dawn. The ground from the landing ground for a distance of 6 miles was soft; after which we again struck the rock outcrop, which made ploughing difficult. The track was straightened over the western branch of the Wadi Muhammadi, and also over that portion of the desert to the left of the limestone banks and broken country. Nothing of event took place during the day, and the convoy passed to the south of Landing Ground 3, and finally camped 4 miles west of the landing ground. W/T message reporting progress was sent to No. 70 Squadron. Distance covered, 31·73 miles.

9 October 1922. Struck camp at dawn and ploughed to Landing Ground 4, where we arrived at 12.00 hours. The circle was re-marked and progress resumed to a distance of 800 yards west of the landing ground, when the cylinder head of the tractor was found to be cracked. The tractor was dismantled and the spare cylinder head assembled; at the same time piston heads were decarbonized, and the convoy moved on in three-quarters of an hour. We camped that night 8 miles west of Landing Ground 4. The country covered during the day was to a great extent dotted with camel shrub. Hares and small game were plentiful. The subsoil was soft and turned over easily. Distance covered, 35 miles.

10 October 1922. Camp was struck at dawn and the furrow continued to Landing Ground 5 without event. As I had expected a re-fuelling machine at this point, I halted the convoy for three hours, during which period the circle was re-marked. I drew 50 gallons from the recently constructed petrol dump, and as no signs of the re-fuelling machine were visible, progress was continued to a point 10 miles west of Landing Ground 5. This country contained a quantity of stones and calcareous rock, which had a tendency to throw the plough out of its furrow and blunt the points of the shares. The best ground for ploughing lay in the bed of the undulating ground. On a W/T message being sent reporting progress I was informed that the re-fuelling machine had crashed between Landing Grounds 2 and 3. I therefore prepared to off-load two tenders and proceed to their assistance; at the same time I instructed the W/T operator to endeavour to get into wireless communication with them. This he finally succeeded in doing, when they informed me that they did not require assistance. My Newton generator attachment was transmitting to Baghdad with ease, and worked splendidly the whole time. Distance covered, 31·12 miles.

11 October 1922. Progress was continued at dawn, and I instructed the W/T tender to proceed to Landing Ground 6 and to get into communication with No. 70 Squadron, as I was anxious to find out what arrangements were now being made for re-fuelling me.

The furrow was continued beyond Landing Ground 6, which lies 5 or 6 miles away from the route. W/T signals were received stating that Flight Lieutenant E. G. Hilton and Squadron Leader S. W. Smith were on their way to Landing Ground 6 in a Vickers-Vernon (Napier Lion), and were carrying the stores I had asked for in my previous W/T message. This machine landed alongside the track 5 miles west of Landing Ground 6, when the convoy was re-fuelled with 50 gallons paraffin, 100 gallons water, and two drums of oil. Squadron-Leader Smith inspected the convoy, and drove on with me until we camped that night at a point 8 miles east of Landing Ground 7. In the mean time the Vickers-Vernon had returned to the crashed Vernon for further stores. The ground traversed was chiefly undulating land and wadis, which turned over easily. It abounded in small game and during the day several lesser and greater bustard were observed. These are difficult to shoot, as they disappear into the scrub very quickly, and run like guinea fowl. A number of stone circles appear at the foot of most of the hills; they are well preserved, but the few I examined carried no inscription, although such inscriptions similar to those in the Sinai desert are common in the lava belt around Tall Teida. I have in my possession photographs of these taken on the original survey. Distance covered, 24·68 miles.

12 October 1922. Camp was not struck until 10.30, as we were awaiting the arrival of the Vernon from Landing Ground 3 with its stores. The Officer Commanding No. 70 Squadron left in the Vickers-Vernon before we moved off. Ploughing was continued to a point 8 miles west of Landing Ground 7, which was re-marked *en route*. The country is rocky, the surface consisting of calcareous rock and sandstone. Oil trouble was experienced on one of the tenders, which caused a slight delay, but was finally remedied. After passing through the broken country beyond Landing Ground 7, manganese ore was found in what would appear to be in large quantities in the hills. There was also another mineral I noticed in small quantities, which resembled iron pyrites. I had intended bringing specimens back with me on my return journey, but was unable to do so as I was relieved at Landing Ground 9 on the way back. Distance covered, 19·5 miles. Progress reported to No. 70 Squadron by wireless.

13 October 1922. Continued at dawn, ploughing to a point 4 miles east of Landing Ground 8. Five miles from our camping ground, flat-topped hills come into view (Tuwaidat-al-Kalb), and Tallul-ash-Shaur is visible on a bearing of 285° magnetic. The ground passed over is very stony, and that night we changed thirteen tyres and two rear shackle bolts. Steel-studded tyres are not recommended, as stones penetrate the sides, after which the studded tread itself tends to destroy the cover. Palmer cords or Avon tyres last much longer than steel-studded tyres. Distance covered, 27·156 miles. W/T to No. 70 Squadron on progress of the day.

14 October 1922. Camp was struck at dawn and the furrow continued to Landing Ground 8, where the number was re-marked. Shortly after leaving this landing ground, the Baghdad–Cairo Air Mail passed over us. I placed ground signals notifying them that I required nothing, when they dropped a message stating that the track could be seen looming out ahead as far as the horizon. Some difficulty was experienced in ploughing into the Wadi Rutba, as in places the sides are precipitous, and a large number of boulders impede progress. This was finally overcome and ploughing continued to the well. Here I found eight tents of a nomadic Arab tribe called the Selaib. I re-fuelled with water and purchased a goat. Wadi Rutba contains eight wells of excellent water, at a depth of 40 to 50 feet. Some of the Selaib are usually to be found in the vicinity of wells, and are useful for drawing water and giving one information as to the movements of other denizens of the desert. The wells are cut through solid limestone and must be of considerable age, from the cord wear on their sides. The water is very soft and does not appear to contain either iron or sulphur as in the wells at Al Jidd.

Car convoys should be advised to carry with them some method of drawing water. I utilized the W/T wire drum, which, with a box spanner as axle, forms an excellent substitute for the native zakiya. The old car track in the Wadi and for some distance, was completely obliterated. I therefore proceeded with one car on bearings I had taken on the original survey. After proceeding 1½ miles I triangulated on Tallul ash Shaur and Rutba well to locate my position. I found myself to the left of the track, which I picked up and retraced to Rutba, but lost it again before entering the Wadi. The country around is very broken and covered with large boulders. The magnetic bearing from Rutba well to Holt's Arrow is 270°. On arriving at the well I left two tenders to complete watering, and went ahead with the plough to Landing Ground 9, which is in the entrance of the Wadi Abaili, and I re-marked the landing ground. Shortly afterwards I received a message that one tender was badly bogged at Rutba, and accordingly I proceeded there with the tractor, but while this car was being extricated the crown wheel of the differential collapsed. The car was eventually towed out by the Fordson tractor and was repaired during the next day. The extrication of a loaded Crossley should not be attempted under its own power unless absolutely necessary, as the differential is liable to collapse under the strain. As it was impossible to move the damaged tender that night, I instructed the W/T car to proceed to Landing Ground 9 and wireless my position, at the same time to find out when I might expect re-fuelling machines. I remained at Rutba that night, and work was started immediately on the damaged vehicle. Distance covered, 19·5 miles.

15 October 1922. On rising at dawn I discovered we had been sleeping in an old graveyard, consisting of several hundred graves. These appear to be either early Christian or possibly may be those of the

"ancients," spoken of by the Arabs. They are certainly not Muhammadan, as they are not laid to Mecca. This I tested with the compass. They are in a fair state of preservation. Rutba must have been a place of importance, as there are a large number of these graves on either side of the Wadi, and there are also traces of the handiwork of man in the surrounding hills. There is a legend current among the Arabs that at one time that portion of the desert was peopled and cultivated, and that it was ruled over by a king, who is supposed to have made the wells at Al Jidd and Rutba. Repairs were carried out on the damaged Crossley tender during the morning. I myself proceeded to Landing Ground 9 to await the arrival of the two re-fuelling Vernons from No. 70 Squadron, whose signals to Baghdad could be clearly heard on our W/T. These machines landed at 12.30, bringing out twenty outer covers, 100 gallons paraffin, and 100 gallons petrol. During the remainder of the day minor repairs were carried out and tyres renewed. W/T to No. 70 Squadron.

16 October 1922. I proceeded to Rutba, when I found that the damaged car would be ready in two hours. Great difficulty had apparently been experienced in extricating one of the road shafts, which was bent. The Selaib presented the convoy with another goat and also a gazelle, for which presents of jam and tobacco had been given: useful commodities for exchange. I returned to Landing Ground 9 and drew petrol for the remaining cars, after which the Vickers-Vernons left for Baghdad at 10.30. The repaired tender arrived from Rutba at 12.30, but on resuming progress the shackle bolts collapsed on another car. I therefore left Flying Officer Oxley-Boyle with two drivers to repair this, instructing him to follow me up as soon as possible. This he did, and rejoined the convoy within three hours.

The furrow was continued along the Wadi Abaili that afternoon to a point half a mile east of Landing Ground 10. The Wadi itself was easily ploughed and a deep furrow was formed. I did not consider it practicable to straighten the course at this point, as the country on either side appeared difficult, and I was anxious to get on as quickly as possible as there were indications of rain, which fell that night accompanied by a thunderstorm. This made W/T transmission impossible. Distance covered, 17·5 miles.

17 October 1922. The convoy left camp at dawn and ploughed past Landing Ground 10 to Al Jidd. The surface of the country was covered with chert and flint, which tended to heavy consumption of plough points. On arrival at Al Jidd the circle and number were re-marked and the convoy re-fuelled with water from the wells. Al Jidd water is not very good, as it contains iron and sulphur, and the natives allow camels and flocks to herd at the mouth of the wells. Water was found only in two of the deepest wells at about 80 feet down. The wells are like those at Rutba, and are also cut through solid limestone formation. There

were eight tents of the Selaib there, who assisted in drawing water, and from whom I purchased a goat. Two of them remained the night with us, and informed me that forty of the Shumma tribe had passed through on the previous day on their way to raid the Anaiza. He also warned me to keep a sharp look-out, especially when the sun went down and at dawn, for other raiding parties which were about. He had broken his arm, and his companion was suffering from eye trouble. I rendered what aid I could with material available, and they were very grateful. A thunderstorm prevented W/T communication that night. Al Jidd was infested with black scorpions. Distance covered, 30·5 miles.

18 October 1922. The convoy left Al Jidd for Landing Ground R at dawn, when I sent the W/T car on to erect the masts and get into communication with Baghdad. Ploughing across the Hadad presented little difficulty, and R was reached at 11.10. The circle and lettering were re-marked and W/T communication was obtained with Baghdad. After this, communication became impossible owing to a thunderstorm accompanied by heavy rain. Distance covered, 17 miles. Total distance covered since leaving Baghdad was approximately 390 miles.

19 October 1922. The return journey was commenced at dawn. The furrows were overlapped by corresponding markings, which filled in the interval, but 10 yards' distance from the original furrow. Before arriving at Al Jidd we met a Selaib who came across with us on the original survey. He offered hospitality, which however we had to decline, as we were on the move. On arriving at Al Jidd I rejoined the two leading tenders which I had sent forward to draw water and to erect the W/T in case of messages having been interrupted by the thunderstorm of the previous afternoon. I also thought that by placing a copper mat down the well a better earth might have been obtained if the signals were weak; this, however, was unnecessary, as communication was obtained without difficulty. Ploughing was continued to a point 17 miles east of Landing Ground 11, where we camped for the night. Quantities of porcupine quill were picked up in a Wadi close to this point. W/T communication was established with Baghdad, and I received a message that I was to be relieved the following day, to prepare for embarkation to the United Kingdom, since I had completed my tour of service overseas, and was on the first draft. Distance covered, 34·5 miles.

20 October 1922. Convoy struck camp at dawn and ploughed to Landing Ground 10, and re-marked landing ground. Ploughing was continued along the Wadi Abaili and a very deep furrow formed from here to Landing Ground 9, where I camped for the night. I received a W/T message from Baghdad that a re-fuelling machine was leaving at dawn from No. 70 Squadron on the following day.

22 October 1922. Awaited the arrival of the Vickers-Vernon, which landed at 10.00. During this time cars were overhauled, and I also made a survey of some of the surrounding hills. Felspar is found in

large quantities embedded in the rock, and also oxide of iron. In one hill I found a salt that resembled sulphate of copper, but in very small quantities. At the foot of several hills there are the remains of what appear to be old cuttings, as though mining shafts had been made into the hills. The spoil heaps on either sides of these openings are very evident. The subsoil from these heaps resembles in some places finely ground silica mixed with sulphur, and in others consists of a fine chalk deposit. A number of fossil seashells are found on the summits of some of these hills, which might indicate the presence of phosphates. There are innumerable circles of stone, and in some places what appears to be remains of houses.

Flight-Lieutenant P. M. McSwiny arrived in the Vickers-Vernon to take over the command of the convoy. After handing over to him I returned to Baghdad the same day. From the air the marking appeared very visible, and gave one the impression of a pencil having been drawn across the desert.

NOTE ON PROFESSOR J. D. EVERETT'S APPLICATION OF MURDOCH'S THIRD PROJECTION

A. E. Young, F.C.G.I., A.M.I.C.E.

IN the *Geographical Journal* for February 1904 there appeared a paper by the late Professor J. D. Everett, F.R.S., "On a Flat Model which solves problems in the use of the globes," which was read at a meeting of the Research Committee of the Society on 16 November 1903. At that meeting Colonel Sir Charles Close (then Major Close), the late Director-General of the Ordnance Survey, was present, and it occurred to him some months ago that possibly the system of projection there described might be useful for air-craft navigation. He accordingly mentioned the paper to Captain G. T. McCaw, Geographical Section, War Office, who asked me to look into the matter.

I had not previously heard of Prof. Everett's paper, and on examining it found to my surprise that the projection described was essentially none other than the Third Projection of Murdoch invented in 1758 and described in the *Philosophical Transactions of the Royal Society* for that year. A brief account of the properties of this projection is given at pp. 39–41 of my pamphlet 'Some Investigations in the Theory of Map Projections' (R.G.S. Technical Series No. 1, 1920). It is there shown that Murdoch's Third is an equidistant conical projection with two standard parallels, so arranged that the total area of the map is true and the scale errors equal on the upper and lower bounding parallels of the map. It is also shown that this projection is practically identical with the minimum error projection of the conical class as obtained by extending to the more general case the principle applied by Airy to the

zenithal class, *i.e.* to discover by means of the Calculus of Variations the form of conical projection in which the average scale error is a minimum.

There is not the slightest reason to suppose that Prof. Everett was aware of Murdoch's pre-discovery, especially since the properties of the projection were only very briefly indicated by its inventor in the above-mentioned paper to the Royal Society, and its value had been lost sight of owing to some rather disparaging criticisms by Germain, who also does not seem to have fully examined it. The absolute independence of Everett's discovery is also borne out by the form of his mathematical investigation, for he determines one of the constants by its value for the equator or latitude zero, instead of by its value at the pole or latitude 90°. He also determines the correct value for the constant of the cone n, which was only implicitly indicated by Murdoch, and which I (see p. 40 of pamphlet) had supposed was first explicitly stated by myself, viz. $n = \cos\psi \sin\delta/\delta^2 \cot\delta$, where ψ is the colatitude of mid-parallel and δ half the depth of the map in circular measure. The late Prof. Everett's scientific activities were, I think, little connected with such subjects as maps and surveys, and it seems to me a remarkable thing that these two men, the Rev. Patrick Murdoch and Prof. J. D. Everett, should 150 years apart quite accidentally and by a kind of geometrical intuition have hit upon a map projection which was practically the best of its class on Airy's criterion.

Prof. Everett in his paper advocates applying this projection to successive zones of the Earth, 10° deep in latitude, from equator to pole, and he made a model in pear-wood to illustrate his proposal. These strips, as he shows, will have a rolling fit along their edges, owing to the fact that the scale at limiting parallels is $\tan\delta/\delta = 1 + \frac{1}{3}\delta^2 + \ldots$, and thus depends only on the depth of the strips, which is the same in all. He makes his lowest strip extend from 0° to 10° latitude, or a mean latitude of 5°, and it consequently has a slight curvature. In my opinion it would have been better to make the lowest strip extend from $-5°$ to $+5°$, with mean latitude on the equator, and consequently straight edges.

Prof. Everett also makes statements as to the errors of the projection on p. 235 of the *Journal*, some of which are not quite correct. It is shown in my pamphlet (p. 33) that the errors of the conical projections, to the first term of their expansions, are independent of the mean colatitude of a zone and depend only on its depth. We can therefore find them to this degree of approximation by examining only the zone with mean latitude 0°, that is, a cylindrical zone, for which the mathematical expressions are simpler. For this cylindrical zone, the finite errors of bearing and distance for the straight line between two points 1, 2 will be given by the same expressions as for the minimum error Cassini projection with two standard parallels, but turned through a right angle. These expressions are given on p. 71 of the pamphlet, where for the y coordinates we must take the difference of latitude from mid-parallel, and for Y half

the depth of a zone, and for Δx we must take the difference of longitude. For the bearing t_1 in those formulæ we must write $90°-t_1$. It will therefore be seen that Prof. Everett is not quite right when he says in the third paragraph on p. 235, viz. :

"If, instead of making the points of contact lie on a meridian, we make them lie on any other straight line, this line represents a great circle on the globe, and the region lying within a few degrees of it is correctly represented. The same remark applies to any track laid down on the pieces and passing through their points of contact; its length is the same measured on the pieces as measured on the globe, etc. . . ."

For, consider a line passing across the zone diagonally from one bounding parallel to another. Then $y_1=-y_2=Y$, and the expressions for the angle between the projected geodesic and the straight line from 1 to 2 become $\delta_1=\Delta x\,.\,Y/6r^2=-\delta_2$. The distance error, it is true, vanishes because $y_1^2+y_1y_2+y_2^2-Y^2=0$ when $y_1=-y_2=Y$. The projected geodesic is therefore a meandering line of double curvature cutting the direct line at points of contact of zones and at middle points of zones. The angular deviation between them at bounding parallels, with zones 10° deep, is about 9′ of arc, and at mid-parallel double this value, for a line bearing 45°.

With regard to using Everett's model to find the distance and bearing between two points two or more zones apart, I have found considerable difficulty in setting the model so that the straight line between the two points in question does pass through the points of contact of the strips. Even then the bearing could not be protracted with any precision, and I do not think that there is much scope for using the projection in the form of a model in wood. Possibly more success might be obtained by plotting the zones on tracing paper, but I doubt whether after all the trigonometrical calculation would not be quicker and more satisfactory in practice.

As a map projection the one under review is certainly the best of its class in that for its size the errors are on the average the smallest possible. If, however, the maps are to be used for some purpose in which great precision is wanted, so that it may be necessary to compute errors, I would advocate making the projection orthomorphic, for then the expressions for calculating corrections are much simpler. In this case the radii of limiting parallels and mid-parallels are not altered, but the parallels lying between them are moved inwards to the mid-parallel in the proportion $1-\delta^2/6+\epsilon^2/6$, where ϵ is the difference of latitude in circular measure from the mid-parallel (see ' Map Projections,' p. 44).

THE ROSS DEPENDENCY

THE *London Gazette* of 31 July 1923 contained an Order of the King in Council made at Buckingham Palace on the day before, constituting the Ross Sea sector of the Antarctic a British Dependency under the jurisdiction of the Governor-General and Commander-in-Chief of the Dominion of New Zealand.

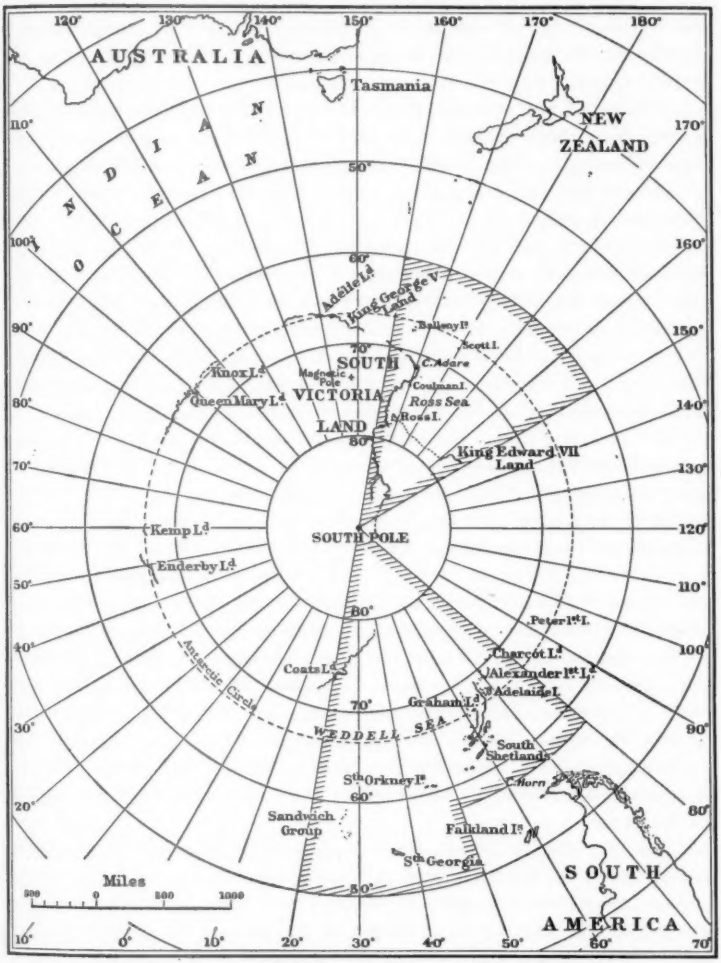
The preamble to the Order relates that by the British Settlement Act, 1887, it is lawful for His Majesty in Council to establish all such laws and institutions and constitute such courts and officers as may appear to His Majesty in Council to be necessary for the peace, order, and good government of His Majesty's subjects and others within any British Settlement: and that the coasts of the Ross Sea, with the islands and territories adjacent thereto, between the 160th degree of East Longitude and the 150th degree of West Longitude, which are situated south of the 60th degree of South Latitude, are a British settlement within the meaning of the said Act.

The Preamble of the British Settlement Act (50 and 51 Vict. c. 54) is as follows: "Whereas divers of Her Majesty's subjects have resorted to and settled in, and may hereafter resort to and settle in, divers places where there is no civilised government, and such settlements have become or may hereafter become possessions of Her Majesty, and it is expedient to extend the power of Her Majesty to provide for the government of such settlements, and for that purpose to repeal and re-enact with amendments the existing Acts enabling Her Majesty to provide for such government"; and clause 6 defines a British settlement thus: "6. For the purposes of this Act, the expression 'British possession' means any part of Her Majesty's possessions out of the United Kingdom, and the expression 'British settlement' means any British possession which has not been acquired by cession or conquest, and is not for the time being within the jurisdiction of the Legislature, constituted otherwise than by virtue of this Act or of any Act repealed by this Act, of any British possession."

The Order in Council of 1923 then proceeds: "From and after the publication of this Order in the Government Gazette of the Dominion of New Zealand that part of His Majesty's Dominions in the Antarctic seas, which comprises all the islands and territories between the 160th degree of East Longitude and the 150th degree of West Longitude which are situated south of the 60th degree of South Latitude shall be named the Ross Dependency," and the following clauses appoint the Governor-General of New Zealand for the time being, or in his absence the Officer Administering the Government, to be the Governor of the Ross Dependency, with power to make rules and regulations, and grants and dispositions of any lands which may lawfully be granted or disposed of by His Majesty.

The territories thus formally brought under administration had already been declared, at various times and in different places, to be British possessions. On 12 January 1841 Ross landed on Possession Island and took

possession of "these newly discovered lands" in the name of Queen Victoria, and in the following month the lands between the 70th and 90th parallels were given the name of Victoria (Sir James C. Ross, *Voyage of*



Sketch-map of the Falkland Islands and Ross Dependencies.

Discovery . . . 1839–43, Publ. 1847). On 17 October 1908 the Northern Party of the Shackleton Expedition landed at Cape Bernacchi opposite Ross Island and renewed the declaration of possession for the British Empire. On the 16th of the following January Professor David also

formally claimed possession for the British Empire of the area "now containing the South Magnetic Pole": but this is outside the sector recently declared a British Settlement. Our Society may feel a little disappointed that another area is excluded, almost by chance. The 160th meridian goes out on to the Barrier just south of Mulock inlet in 79° S., and Mount Keltie, Mount Mill, Mount Reeves, Mount Darwin, all stand sadly just outside British territory!

British geographers throughout the world will feel gratified that this remote dependency shall—if it has to be brought under any formal administration, and in view of possible whaling developments it is a wise precaution—be controlled by the Dominion of New Zealand. The exploration of the Ross Sea area has been in by far the greatest part a British enterprise, and in this century three British expeditions have spent a couple of years each ashore. The first Shackleton expedition ascended the Beardmore glacier and reached the high polar plateau which is so large and unexpected a feature of the world. The second Scott expedition reached the Pole, but found themselves forestalled by Amundsen's skilful and unanticipated foray. And the ground is consecrated in British memory, for Scott and his four comrades rest there, in British territory.

The procedure which has been followed in making this latest accession to the British Dominions beyond the seas will be of interest to students of political geography: it is not quite the same as that by which another sector of the Antarctic was made into the Falkland Islands Dependencies in 1908 and 1917. On the 4th of July in the former year a letter was read at the Privy Council from the Earl of Crewe, one of His Majesty's principal Secretaries of State, to the Lord President of the Council transmitting a draft of Letters Patent appointing the Governor of the Falkland Islands to be Governor of South Georgia, the South Orkneys, the South Shetlands, the Sandwich Islands, and Graham's Land, and providing for their Government as Dependencies of the Falkland Islands. The draft was approved by His Majesty in Council, and orders were issued for the preparation of a warrant for passing under the Great Seal of the United Kingdom Letters Patent conformable to the draft. The actual Letters Patent are dated 21 July 1908.

The preamble of these Letters Patent reads, "Whereas the groups of islands known as South Georgia, the South Orkneys. the South Shetlands, and the Sandwich Islands, and the territory known as Graham's Land, situated in the South Atlantic Ocean to the south of the fiftieth parallel of south latitude, and lying between the twentieth and the eightieth degrees of west longitude, are part of Our Dominions, and it is expedient that provision should be made for their government as Dependencies of Our Colony of the Falkland Islands:"

The first article of the Letters Patent declares that the above territories shall become Dependencies of the Falkland Islands; the second vests all powers of Government and legislation in the Governor of the Falkland

Islands; and the sixth provides that "the Governor is, and shall be deemed always to have been, authorized and empowered to make and execute, in Our name and on Our behalf, grants and dispositions of any Lands which may lawfully be granted or disposed of by Us within the Dependencies.

Some points of interest will be noted. The British Settlement Act is not invoked, though the islands and territory named were already part of the British Dominions: Captain Cook had taken possession of South Georgia in 1775; Captain William Smith had landed on King George Island and taken possession of the South Shetlands in 1819; Captain George Powell did the same for the South Orkneys in 1821; and Captain Biscoe for Graham Land in 1832. The Letters Patent of 1908 named these lands, with the Sandwich Islands; but did not cover anything else in the sector specified, which comprises indeed the southern extremity of South America.

The extension of British rule over the area shown in the figure dates from 1917. On March 28 in that year were issued Letters Patent, passed under the Great Seal of the United Kingdom, providing for the further Definition and Administration of certain Islands and Territories, including "Graham Land, otherwise known as Graham's Land," as Dependencies of the Colony of the Falkland Islands.

The preamble recites that doubts have arisen as to the limits of the groups of islands . . . and "it is expedient that provision should be made for the Government, not only of these islands and territory, but also of certain other Our islands and territories adjacent thereto as Dependencies of Our Colony of the Falkland Islands."

Thereupon it is declared that these Dependencies "shall be deemed to include and to have included all islands and territories whatsoever" between 20° and 50° W. south of 50° S., and between 50° and 80° W. south of 58° S.

These Letters Patent of 1908 and 1917 were published in the *Government Gazette* of the Falkland Islands, but not in the *London Gazette*, so that the above details are not quite easily found. We are indebted to the courtesy of the Colonial Office for the loan of printed copies of the documents.

We understand that the technical difference between the procedure by Letters Patent under the Great Seal and by Order in Council is that the first is a direct exercise of the Royal Prerogative, whereas the second is an exercise of a power of the King authorized or controlled by Act of Parliament. To discover why in two cases so apparently similar it was desirable to follow different paths may attract some student of political geography in search of a subject for a degree-thesis; but the difference is perhaps more curious than important, and may even be accidental. The accomplished fact is likely to be of the first importance, and welcome as an augury of determination to leave nothing to chance in the enterprise that the Colonial Office Committee has taken in hand, of fitting out Scott's old ship the *Discovery* for scientific research in Antarctic waters.

KALAT-I-NADIRI

Col. J. K. Tod, C.M.G., Indian Army

IN the *Journal* for December 1906 is an account by the Consul-General of Khorasan, then Major P. M. Sykes, of a visit which he paid in September 1905 to Kalat-i-Nadiri. As that account is now eighteen years old, it is perhaps not too soon for the *Journal* to find space for some recent impressions made by the same enchanting journey. Major Sykes congratulated himself on his good fortune in obtaining entrance to the "jealously guarded stronghold, in which no previous Consul-General had been permitted to set foot." It was my good fortune to be in Meshed during 1919 in circumstances that specially favoured visits to outlying points on the frontier, and I eagerly availed myself of the opportunity to view so romantic a spot as Kalat-i-Nadiri. The Governor-General not only granted ready permission, but personally interested himself, sending on word to the local governor, and detailing an officer of the Meshed garrison as my guide.

Early in the morning of May 3 three of us set out from Meshed—Captain Blacker of the Guides, Isa Khan, our Persian guide, and myself. We rapidly accomplished the 18 miles across the Meshed plain to the foot of the northern mountains by Ford car. Not without difficulties, where no real road exists, the car got us almost to Andarukh. There horses awaited us, and a small escort of "the Guides." From this point to Kalat-i-Nadiri is 44 miles by a rough mountain track. The Andarukh gorge, or "Darband," is a fitting portal to the wild region beyond. The route traverses a succession of defiles between rocky heights of great grandeur, but the scenery has the charm of contrast, for a clear rapid stream is followed, which brings verdant beauty to the valley, while the villages nestle among groves of poplar, willow, mulberry, and plane, with orchards adjoining. The first of these villages is Kardeh, where the road forks, one track going due north over the mountains to Kakhka on the Trans-Caspian railway, while our route branches north-east, and is marked by the telegraph line.

The next village is Al, a favourite summer resort of Meshed citizens, and a little further on the valley opens suddenly, from a narrow gorge, on a grand view of the peak of "Panj Man" ("Five Stun"). It is pyramidal, but topped by a stupendous crown of vertical rock. The name is a survival of an old-time jest about the weight of the huge cylindrical mass.

Here, too, a little above the left bank of the stream, a flat rock face bears a finely chiselled inscription which records a victory by a Bokharan invader, Fateh Muhammad Sheibani, in A.D. 915.

Continuing, the road passes below the grim heights which Macgregor named the "Kuh-i-na-Mumkin," ascends the Darband-i-Shikasta, or

Shattered Ravine, where it is a mere rock staircase among the huge boulders that are scattered in wild confusion, then winds up other rugged defiles, and emerges at 17 miles into the comparatively open valley of Bulghur. The inhabitants of all these villages are of Turkish stock, and like highlanders in all lands, are a virile race compared with the Meshed city folk.

Next day's march began with the Zao-i-Pir Zan, or Gorge of the Old Woman, a name that Persians are wont to give to peculiarly rugged and forbidding features of their roads. The gorge pierces the southern of the two great spurs which form the eastern continuation of the Hazar Masjid range. The track led up the rocky bed of the stream between precipices so close together that there was hardly room to lead our horses over the bare slippery rock. We emerged at length upon green sward, bright with spring flowers, and the track led on over grassy spurs, skirting the northern range, the Kara Dagh, and gradually leading up to the Duiuk Boyun (Camel's Neck) Pass.

A grand view opens up eastwards, the distant frontier mountains above the valley of the Hari Rud framed between precipitous crags. The immediate ascent to the pass is a steep rocky zigzag: the summit, at 10½ miles from Bulghur, a sharply cut ridge; and the descent begins immediately into a bleak treeless valley, in which the village of Vardeh is seen far below.

The Turkman headman received us hospitably, and it was noon before we resumed the march. The first few miles were easy going over barren uplands, past the village of Bagh Kand, until we reached the edge of a deep re-entrant in the escarpment by which the frontier range falls to the northern lowlands.

Through the gap formed by the re-entrant we gained our first view of the great south-western rampart of Kalat-i-Nadiri. The path led steeply down the deep-cut valley, at first enclosed by sheets of bare rock at a high angle, then narrowing between sheer precipices. The slippery surface worn smooth by the stream made the going dangerous for shod horses. Strata tilted on end jutted vertically from the face of the precipice, as shown in Major Sykes' photograph; but the rugged framework enclosed pictures of soft beauty. Hawthorn in full flower scented the air, and honeysuckle grew in profusion.

At 9 miles from Vardeh the valley of the Issik Su (Warm Water) is reached, and the path follows the stream through a defile between fine crags. It is this passage which is called the Darband-i-Giaour, and not the upper part of the valley. At its exit is the pleasantly situated village of Hammam Kala. Here a reception party from Kalat-i-Nadiri awaited us, and escorted by them we rode fast down the broad green valley with the great rampart of Kalat-i-Nadiri on our right, lofty serrated mountains on our left. The marvel of this, the longest face of the natural fortress, is its straightness and regularity, 15 miles from north-west to south-east at

an almost even height of 1500 feet. The greater part of the height is detritus at a very steep slope, though not inaccessible, but except at the Arghawan Shah gap the whole length is crowned by vertical cliff with scarcely a fissure in which a goat could find foothold.

At 3 miles from Hammam Kala the Issik Su turns sharply to enter Kalat-i-Nadiri by the grim gateway of Arghawan Shah, a magnificent cleft in the rampart wall. The entrance is cultivated and wooded. Then path and stream together traverse a gorge between sheer cliffs sometimes only 20 or 30 yards apart. The triple-arched barrier fortification portrayed by Macgregor and by Curzon was demolished by a flood, said to have been in 1905, the year of Major Sykes' visit. Only one arch remains standing, and fallen masonry lies in the bed of the stream. Immediately inside is a village with well-wooded enclosures. Towers and battlemented walls in a dilapidated state are perched upon the steep slopes. In a rickety shed facing the " Darband " is an antiquated field gun on a broken-down carriage. The defences of the entrance are altogether decayed and useless.

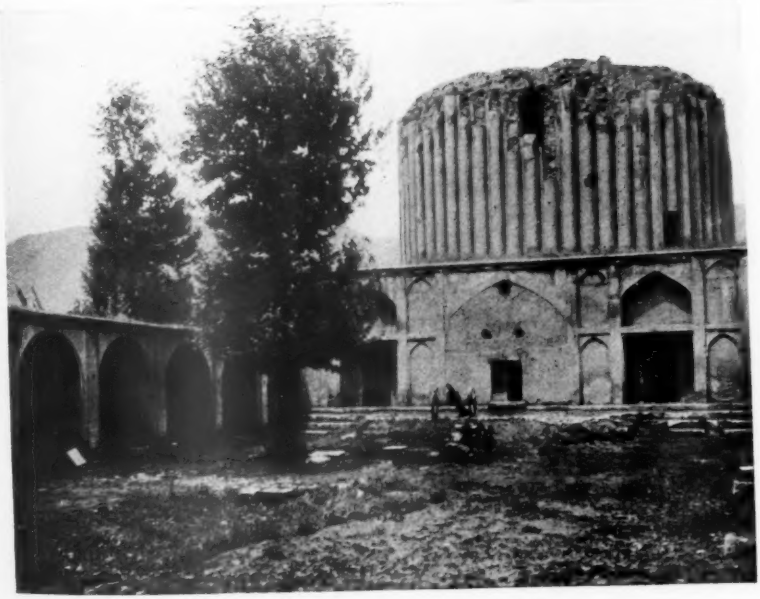
We rode on for 2 miles by a rocky path along the hillside above the left—northern—bank of the stream before we reached Kabud Gumbaz, the Khan's residence, in a sheltered situation among the dense foliage of walled gardens and orchards. The Persian flag was flying over a mud wall enclosure. Across the road was drawn up a guard under the decrepit old commandant.

A cobbled ramp under an arched gateway led us into the main courtyard of the Mukbarra of Nadir Shah. Dismounting, we entered by a low doorway into an inner garden court, where we were welcomed by the Khan, Fateh ul Mulk, and shown into the room prepared for us.

The Mukbarra is an octagonal building with rooms built round a lofty central chamber which rises high above the rest, is surrounded by sandstone columns—*not* fluted, as some accounts state—and was evidently at one time roofed in with a dome. The dome has long since fallen in and the central chamber is open to the sky. The occasional thud of falling masonry detached by the heavy rain that fell during our stay intimated that the process of decay continues rapidly, and made our quarters feel none too safe. Some of the stone panels of the lower part of the building are decorated with patterns in relief of trees and flowers similar to those seen on the Mogul buildings of Delhi and Agra, but of very inferior workmanship. Below ground-level are the vaults which formerly contained the treasures amassed by Nadir Shah ; the entrance, on the east side, was choked with masses of rubble.

The area enclosed within the natural ramparts that shut off Kalat-i-Nadiri is about 25 square miles. Almost the whole area drains to Issik Su, which, after entering by the Darband of Arghawan Shah on the south-western face, issues by the Darband-i-Nafta on the northern face, a course of about 10 miles within the limits of Kalat-i-Nadiri. Besides

THE PANJ MAN



THE MUKBARRA OF NADIR SHAH

THE DARBAND OF ARGHAWAN SHAH FROM WITHIN, LOOKING WEST

From a drawing by Col. Tod.

the two main gateways of Arghawan Shah and Nafta, there are three other regular entrances, all narrow and difficult. The Deh Chah pass near the north-west corner, leading to a village of that name one farsakh beyond the rampart; the Chaubast Darband on the east side, towards Haji Buland, and the Kushtani Darband in the south-eastern corner below the Baba Kamagli peak, leading in the direction of Sarakhs. There are also two or three steep footpaths, little better than goat tracks, that give precarious means of entry; otherwise the whole perimeter of some 50 miles is guarded by absolutely impregnable cliffs. The internal communications are rough hill paths, fit only for surefooted animals; even the main path from Arghawan Shah to Nafta is a mere stony pack track.

The morning after our arrival we paid a return visit to the Khan in an annexe to the Mukbarra.

The Khanship has been hereditary in the same family for many generations. Fateh ul Mulk, or Fateh Ali Khan, to give him his name instead of his title, is a man of about thirty-five, a pleasant and courteous host, with the rather listless manner of the better-class Persian. He is grandson of Behbud Khan, who entertained Macgregor at the time of his visit, and of whom the latter wrote as being very intelligent and well read. Kalat-i-Nadiri is now administered as a district under the Governor-General of Khorasan, and is garrisoned by only twenty or thirty soldiers from Meshed. The gardens within the Mukbarra enclosure were shady with plane trees, willows, and poplars, fragrant with roses, and melodious with the song of nightingales.

A little beyond the Mukbarra is the blue-domed mosque from which the place takes its name, Kabud Gumbaz. It is used as the mausoleum of the Khans. The glazed-tile ornamentation of the dome and of the adjoining "Aiwans," though much fallen into disrepair, is still beautiful.

In the forenoon we started to ride up to the Kamar-i-Khist as the best point from which to get a general view. A stiff climb up a rocky spur led us on to grassy uplands bright with spring flowers, sheets of white candytuft, yellow mustard, or blue forget-me-not, sprinkled with scarlet poppies, hyacinths, and irises; but before we reached the village of Khist, clouds had gathered over the hills to the west, and in front of us the "Kamar" itself became shrouded in mist. We turned back none too soon, and made a perilous descent in a terrific thunderstorm.

All through the night, and during the next two days, the rain came down with little intermission, affording additional proof of the isolation of Kalat-i-Nadiri. Secluded at all times, when the "Darbands" were closed by raging flood the place was completely cut off from the outer world. Even the main pathway through Kabud Gumbaz became almost impassable for man or beast.

The third morning broke clear and cloudless, so we started early to make another attempt upon the Kamar-i-Khist. Again we scrambled

THE DARBAND OF ARGHAWAN SHAH FROM WITHIN, LOOKING WEST

up the steep ascent, and by nine o'clock scaled the summit, following the fresh track of an *Ovis Argali*, which showed that our approach had been watched by sharper eyes than ours. Mist had gathered again, obscuring the view. Immediately below us was the northern rampart cliff, and it stretched away eastward, until in the distance its continuity was broken by the Darband-i-Nafta gap. From the foot of the cliff the ground slopes steeply to a maze of foothills and ridges which fall away to the Trans-Caspian plain. The grassy slopes afford pasture to the flocks of nomad tribesmen, some of whose black tents were visible far below. Over the west shoulder of the Kamar leads the difficult path to Deh Chah. Through the Darband-i-Nafta the road leads north-east to Dushakh on the Trans-Caspian railway 16 miles distant, and crosses the frontier at the Darband-i-Khoja half-way.

Temporary partings of the mist clouds revealed extensive views over the Trans-Caspian plain and the Kara Kum desert beyond, stretching like a sea to the horizon. Dark patches on the buff plain marked the wooded enclosures around the stations on the Trans-Caspian railway. To the north lay Kakhka, where in the preceding summer a little British force had joined the retreating Trans-Caspian army and enabled them to make head against the Bolshevist onslaught, and eventually to turn the tables and drive the Red invaders back to the Oxus. Further north-east, but obscured by cloud was Dushakh, the scene of the desperate fight on October 15, 1918, when the 19th Punjabis covered themselves with glory, and struck the enemy the final blow that compelled the abandonment of their enterprise.

Looking backwards over the interior of Kalat-i-Nadiri, the view was of rolling downlike hills with here and there a sharp peak, all draining to the deep valley of the Issik Su which lay below, and all bounded by the wonderful encircling cliffs.

NOTES ON THE OKOVANGO AND KUNENE RIVERS

Maudslay Baynes

I HAVE been interested in articles appearing in the *Geographical Journal*, "The Control of Climate by Lakes," by Prof. E. H. L. Schwarz, vol. 57, No. 3, of March 1921; and "Notes on the Kunene River, Southern Angola," by F. E. Kanthack, vol. 57, No. 5, of May. Being acquainted with the Okovango and Kunene rivers over that part of their courses most in question, that is the easterly course of the former and westerly of the latter, I offer the following remarks.

The first question that presents itself regarding the Okovango is: What proportion of its volume flowing past Libebe, say, may be supposed actually to reach the Zambesi *viâ* the Chobe? If I am right in supposing

that it would be so small a proportion as relatively to be negligible, we then get these further considerations: Since, when the river is flooding and subsequently, say for six months out of twelve, one can push along for mile after mile in a native canoe through what looks like a huge acreage of lush meadows, now and again crossing open water in marshes or even rivers, it would seem that under nature's conditions of to-day the waters of the Okovango are largely functioning as Prof. Schwarz would have them do further south: only that under present conditions the process of evaporation is retarded owing to the cover afforded by standing grass and vegetation [which may, however, in some conditions evaporate more than open water.—ED. *G.J.*]. The question follows: Does the present marsh and flood distribution in this northern area influence rainfall? The Kalahari is well wooded and only a desert in the sense that its sandy surface does not hold water; although the bushman by inserting a hollow reed is able to suck up enough moisture to satisfy his meagre requirements. On digging the moisture recedes. I do not know whether it is considered that the present rainfall in the Kalahari would be inadequate even if the surface were water-supporting. South-west of lake N'gami the sand gives place to limestone over a wide area in what is known as the Ghanzi veld, where I think wells do not need to be sunk to any great depth.

Most maps show a considerable sheet of water south again of this limestone formation and well in the desert in "Anderson's vlei." I believe that this pan was persistently and vainly looked for in recent years, and if more or less correctly placed has presumably disappeared since Anderson saw it (*circ.* 1865). This leads me to suggest that perhaps in drawing conclusions as to general desiccation insufficient allowance is often made for the effect of inundations which have been due only to temporary conditions, such as successive years of excessive rains. In Portuguese East Africa at all events there is evidence that the extensive lake system which runs parallel with the coast has retained more water since the floods of four years ago than it had had for a very long time previously, as massive trees of great age have died from standing in water near the present—1921—margins of these lakes.

I venture the opinion that the Kwito carries a volume of water at least equal to that of the Okovango, and doubles the resources of the latter river below the junction. It is not as wide, but appeared in 1911 to be deeper and much swifter. On the Kwito the Portuguese had stationed an iron vessel, which had been transported from the coast in sections and assembled on the spot. I think they told me it had never had steam up. It was sufficient to ferry my waggon and belongings, though I nearly lost several of the oxen, which had to swim from bank to bank, and which, owing to the current, were washed several hundred yards down-stream during the passage.

The Okovango at Mohongo, where I crossed it on several occasions,

presents a much more formidable appearance than the combined waters of the Limpopo and Olifants below the confluence at normal flow; indeed, it is comparable with the last 20 miles of the Limpopo where the latter is navigable by ocean-going but diminutive steamers. Mohongo is well below Lisho (Libebe), and on the Protectorate side of what was the Caprivi Zipfel, and is the point below which the river begins flooding into the marsh on the south bank.

Before reaching Kwangarri (I was proceeding along the southern border of Angola from east to west) I was held up more than once for days at a time—the months were January to March—and yet I forded the Okovango there in a small boat with ease (absence of current), and my cattle even walked the river-bed for a further distance than they needed to swim. Compare this with my experience in crossing the Kwito before all this rain.

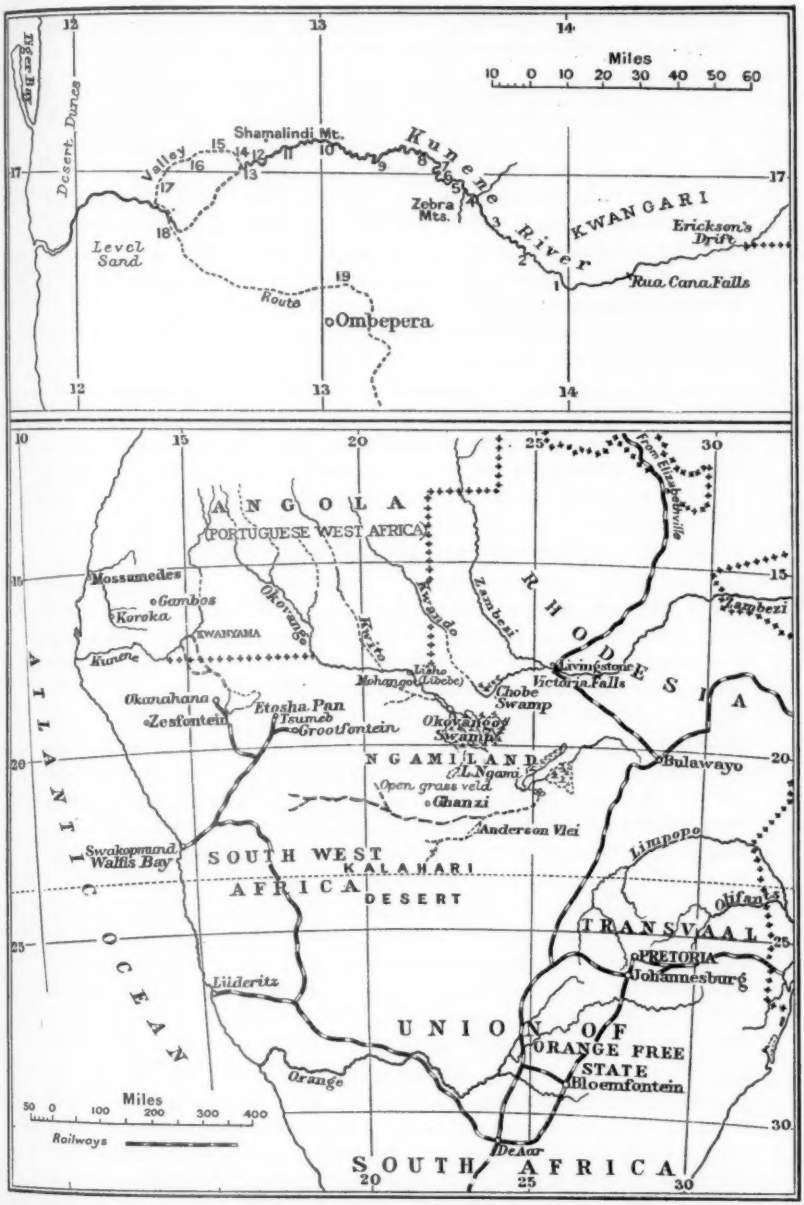
I have a pocket-book which records in pencil my diary from above Erickson's drift to where the Kunene debouches through the last of the mountains on to the desert sand that belts the coast. I will not attempt to give in detail the history of a journey which began in a spirit of picnic and developed into a struggle for bare existence; but extracts from the diary with the accompanying sketch-map may help to bring out the salient features.

I cannot hope to add materially to Mr. Kanthack's information on the section between Erickson's drift and the Rua Cana cataract; but I note the following points: I rode across this drift on a good-sized ox which did not have to swim. This was in the latter part of June, but a dry year (1911). I have noticed, however (particularly with the Olifants and Limpopo), that sandy rivers subject to floods constantly shift their bed sand, so that for the same height of water a drift that one has to swim one year may become less than knee-deep the next. Although the Okovango and country eastward had had copious rains, the country from about halfway between Kwangarri and Kwanyama through to the west coast was suffering from a culmination of drought extending back through several years of scarcity.

I photographed the western fall on July 11—about the same day of the year that Mr. Kanthack saw it—and close inspection shows considerably less water in 1911. In extracts from the diary, given below, on August 20, I noted "clear water-mark along rocks about 5 feet above present level"; and on the 31st of the same month "river falling daily."

Certain Bashimba hunters had attached themselves to my party just before reaching the big cataract, and their name for it was "Pupa." This is remarkable, because the rapids on the Okovango are also called "Pupa" by a quite different people, speaking a totally different tongue.

Mr. Kanthack says: "Of the Kunene below the falls very little is known. . . . At the Monte Negro Falls the Kunene is said to make a drop even greater



Sketch-map of the Kunene River below the Rua Cana Falls, with numbers referring to notes in text: and General Sketch-map to illustrate the paper.

than at Rua Cana, but the information about these falls is very vague. . . . The length of the Kunene described is very wild and unapproachable, and access is only possible along the south bank."

We followed the river along the north bank from Erickson's drift to some miles below the Rua Cana falls before recrossing, and I may remark here that on the only two occasions that natives were encountered from here to the coastal desert they were Bashimba from the north. We swung from bank to bank in the effort to get forward (rapids are continual and generally fordable), and the balance of passable going must certainly be given to the north bank; also, as far as I could judge, should accessibility from the hinterland; and when, under the guidance of local knowledge, we were obliged to abandon the river for a few days, it was a *détour* to the north. When we were finally forced south the earliest signs of native habitation were something like 50 miles in a direct line south from the river. As to the going, the best comment is that from Erickson's drift to the coastal desert took ninety-three days, and thence to Zesfontein (also without roads and through mountains) only twenty-one days. The straight-line distances are nearly equal.

It is difficult to know where to place the Monte Negro falls; but they must either be at point 9 or between 13 and 18 of the sketch: if at the former, then judged by sound the fall must be something less than half that of Rua Cana; if at the latter, the sound which the guide insisted was roaring wind behind the adjacent heights (diary extracts below, 16/9/11) on a calm day in the valley might be this cataract, and if so it is only just behind the mountain gate at point 18. Not to have investigated such matters while in the vicinity would seem to argue lack of enterprise, and I may therefore be allowed to say that I had originally expected to reach the coast and return to Kwanyama in under two months; that in spite of rigid economies the last of the supplies had run out on August 16, since which date game meat and river water were our portion; and when the final turn away from the river was made less than a dozen rounds of rifle ammunition remained. Also I was much bothered with malarial rheumatism, etc., a legacy from N'gamiland.

Mr. Kanthack's sketch-map marks a considerable tributary as the last feature westwards entering from the south. It is worthy of mention therefore that all watercourses encountered after leaving Kasupe's (point 19)—and there were several large-sized river-beds—were headed south, that is, away from the Kunene, and presumably when in spate find their own way west to the coast south of the Kunene mouth. The diary records "all this country (Kasupe's) very high, with an almost cold climate by day" October 2, about lat. 17° S. I did not anywhere find tributary water entering the Kunene; but during rains no doubt it would be impossible to follow it owing to swollen torrents from the surrounding highlands. From near the summit of the "Zebra" mountain (point 4) I could make out a huge basin in a horseshoe of mountain tops to the

north-east, across which basin the winding course of a tributary bed was marked by green vegetation in contrast to the prevailing grey-brown of the landscape. I do not think it was flowing, but very possibly lying in pools; and it came from the direction in which the Bashimba pointed a Portuguese post which they called "Gambos," only two or three days away for a native on foot.

The following selections from the diary are numbered for reference to the sketch-map :—

1. River fordable, rapid, waist-deep, and say 15 yards wide only. Big hills on south bank white. White, cement-like slabs of stone.

2. Cataract facing north, about 20 feet drop, whence river north-west in succession of rapids, and going very difficult. Smooth black rock.

3. Broad, sandy, reed-fringed river-bed from south. "Zebra" mountains approach from south and show west.

4. Zebra-like appearance of this range due to streams of ironstone boulders from knife-back summits, intersected with astonishing regularity by declivities containing grey grass and trees. Small pellets of iron lying on white *débris* in torrent beds. Lower formation a smooth, dull white rock, not friable. Enormous basin in horseshoe of distant peaks north-east brings winding tributary thence to river opposite.

5. Elephants all the way lately. Small tributary river-bed from south. Bashimba from north squatting with cattle, about fifty head of grown beasts. They asked me to give them a paper to the effect that the cattle belonged to me. They say that there is a Portuguese post named Gambos some days to the north-east.

6. Country opens again south side after river has been shut in by ironstone heights to, say, 2000 feet: also temporarily free from rapids.

7. River east-north-east.

8. River north-west with many rocky channels from mountains a few miles to eastward. Appearance in front of hillocks of white (sand ?) covered with small, sparse bush along river, backed by zebra mountains with an occasional white one.

9. Noise of one or two cataracts, but unable to approach (from north bank) owing to many reed-fringed channels. River later in gloomy serpentine westerly course through inhospitable country.

10. For many days past river continually in rapids and often in rocky channel far below and inaccessible. Clear water-mark all along rocks about 5 feet above present level.

11. River far below running placidly between reeds and palms, with large half-moon valley of trees, sand, and grass; and descent fairly easy over plates of slaty stone by zebra tracks. River flowing west-north-west divides mountain range heading from south-east from another range from the north-east. This valley about a mile by a half is the first place since No. 8 where the river has been accessible for more than 100 yards at a stretch. On the north bank towers the bald-faced giant "Shamalindi," and on the south stretches a mountain of smooth contour shaped like a sperm whale.

12. Morning trek about 3 miles in as many hours crossing and recrossing the river. Afternoon climbed high to see the river flowing west between 1000-feet walls of rock. At night within 200 yards of river it took the "boys" three-quarters of an hour to climb up and down for water. Next day through and

over mountains, following zebra paths; going all loose stones and unsuitable for game. The country on this north bank still bad, but mountains receding, and signs of relenting on the other.

13. This morning three Bashimba from the north, hunting. They say it is impossible to follow the river for some distance ahead, but they will take us a few days' *détour* to the north. They say that there are Bashimba living a long way behind the mountains south-east and Hereros south, but a long way back (south). Also Bashimba living to the north in this range, and permanent water; but river unsuitable for occupation. River falling daily. Next day magnificent mountainous views and fairly good going. Sheer mountains lining opposite (north) bank.

14. (Northern *détour*.) Formation changed—tall hills all table-topped, slate and lime. Big mountains west and south. Afternoon again climbed north for three hours, and must be 3000 feet above river.

15. Morning trek through huge basin in mountain-tops; midday halt in limestone cave. Afternoon through plain and up into nek where water lying in blue stone basins, the top one very strong of sulphur. *En route* collected salt. (Next day) morning through enormous basin in mountains. At evening drop of some 2000 feet in front and on both sides.

16. Half morning trek on spur, whence view west-north-west of vast plain, and sand-dunes some 50 miles away. North and south shut off. Hence descent of 2000 to 3000 feet. To sleep without water, a recurring difficulty lately.

17. Into valley with view at last of open country south. Also two huge mountains south-south-west with their feet in level sand. Came on big patch of green; proved to be reeds growing out of salt-encrusted mound, with apparently sweet water streaming from it. Reached river flowing west-north-west, to find it tumbling through deep bed of rock, in one place falling some 50 feet in 5 yards, the ironstone bed being worn into arches, basins, etc. The river flows underneath these natural bridges. Came on footpath running north and south; guide says of natives from south going to Koroka to trade. (Koroka probably native name for Portuguese settlement near Tiger Bay.) Heavy mountains west-south-west some 40 or 50 miles away. At one point heard continuous roaring behind mountain wall to eastward, which guide insisted was wind—a calm day—but which I should have supposed to be a cataract. Afternoon followed path south *up* river and crossed at level, shallow sandy drift.

18. Few miles south down valley to mountain gate where river turns abruptly from east through jagged heights.

The track turned south-east into mountains with long steep ascents and very difficult going. The first water was in limestone basins, fully 20 miles from the river camp We finally came on Hereros under chief Kasupe, some 50 miles south from river having climbed very high into mountains during three days' journey. This chief's usual headquarters, Ombepera, was a good deal further south, and he had moved with a quantity of stock owing to scarcity of water. They knew the river, but not the country south, and their ornaments were from the Portuguese.

Kasupe lent me a fast riding ox and guides, and ten days later we reached Zesfontein.

My experiences lead me to suggest that the best way to tackle the exploration of these regions would be to make a base camp at Kasupe's

headquarters, with a smaller one where the river finally breaks through to the valley level, at which point (No. 18) water and meat are always within easy reach. The route from Zesfontein to Kasupe's presents no very arduous difficulties (given a guide), the worst obstacle being the first trek of nearly 40 miles without water. Beyond that water is always available at easy distances, and the obstacle is merely the nature of the going. Horses might reach Kasupe's; but even if they did they would be useless beyond that point, and I believe the most suitable transport animal, both for riding and packing, would be oxen borrowed from Kasupe's people. They live in the mountains and have feet like iron and are fast. Kasupe was a very old man ten years ago; but these Hereros all appeared to be amicably disposed, and no doubt his successor would furnish assistance. It may not be amiss to utter a word of warning not to count on obtaining water from the river in the region north and north-east from Kasupe's, as it is not unlikely to be found twisting mile on mile many hundred feet below between sheer ironstone walls.

Any such exploration party would need to be armed with the freedom of both banks and permission to shoot anything necessary for provender. At the same time I have no doubt that the easier point of attack would be from the north; either from Gambos along the tributary stream above referred to, or from between the desert and foothills from Koroka. This last route is probably much the easiest and practically a level approach to the river; and whatever the water difficulties may be they are not insuperable to taking a few head of loose cattle for trade *ex* Kasupe. The bald-faced mountain at point No. 11—"Shamalindi," as the Bashimba guide called him—is worthy of special notice. To the east and south he shows a rectangular face as sheer as a cut cheese for perhaps 1000 feet from the summit, of which one gets the suggestion that it must be as plane as the sides.

There was at least one other Herero chief living in the mountains to the east of Kasupe, and I think another south. For the rest in this area I encountered only "Berg-Damatas"; a very black (hence unlike the genuine bushman) and primitive people, usually with small-stock, whose speech consists entirely of clicks and grunts. Bashimba were said to be squatting south of the river but a good deal further east, behind the Zebra mountain section, I imagine; and I should think most of this nation are, or at least originally were, situated in the plateaux behind the north bank. Some of the tribe might have crossed and taken residence south of the river from the same motives as prompted those I met at point 5 to ask for a paper to show that their cattle belonged to me. The Bashimba extend, I think, up to but not east of the Kunene elbow; and I should like to testify to the willingness and intelligence of such of them as I met.

Note: The outline of the Kunene River sketched by the author has been published in Paul Sprigade's "Karte des Deutsch-Portugiesischen Grenzgebiets in Südwestafrika" (*Mitt. aus den deutschen Schutzgebieten*, XXV. 1912).

THE MARINE CHRONOMETER

The Marine Chronometer: its History and Development.— Lieut.-Commander Rupert T. Gould, R.N. (retired). London: J. D. Potter. 1923. *Plates and Diagrams.* 8vo. Pp. xvi. + 287. 25*s. net.*

SOME years ago Lieut.-Commander Gould read at an afternoon meeting of the Society a paper on the history of the chronometer, and exhibited in the Map Room "Harrison's No. 1," which had been entrusted to him by the Astronomer Royal for restoration. It was then clear that the author was gifted with a remarkable combination of historical talent and technical skill: so that we looked forward with interest to the publication of the larger work of which his excellent paper was the portent.

To write a readable book on so very technical a subject is no light task, for few readers can have the mechanical intuition to follow descriptions—though illustrated with plain and sensible drawings—of the beautiful complex devices that have come and gone in the course of the chronometer's development from the "Nuremberg egg." But Commander Gould has had the art to illuminate his most recondite pages with flashes of human interest: while the earlier and more historical part of the book is at once scholarly, amusing, and occasionally exciting.

The great problem of finding the longitude at sea was constantly debated in the ingenious company of the philosophers who formed the Royal Society, and of the Merry Monarch who founded the Royal Observatory. The versatile Hooke turned his attention to the improvement of portable timekeepers in 1659, and invented the balance spring, whose principle he concealed at first in a Latin anagram, according to the custom of the age: but a simple anagram not hard to resolve into the proposition "Ut tensio, sic vis." Sir Christopher Wren imagined three instruments for finding the longitude, but concealed his ideas in the Archives of the Royal Society in an anagram which has never been deciphered! Huyghens, on the other hand, with the assistance of the second Earl of Kincardine, actually constructed a number of timekeepers for use at sea, which for a while were well thought of, and sometimes gave moderate satisfaction in use: but as they were controlled by pendulums and had no temperature compensation, they naturally failed to please for very long, and Huyghens in 1774 proposed to replace the pendulum by the balance spring, to the great indignation of Hooke. Quarrels over priority and charges of dishonourable dealing henceforward fill the history of the chronometer with human interest of the baser kind.

The next great name is that of Leibnitz, who "illustrated his fatal propensity for writing upon subjects whose principles he had imperfectly mastered"; but for a good number of years no real progress was made, and the need became so urgent that in 1714 the celebrated Act of Queen Anne was passed, offering a reward graduated up to £20,000 for any method capable of determining the longitude within specified limits on a voyage from the British Isles to the West Indies. The decision was entrusted to Commissioners, who became known as the Board of Longitude. They had to wait long for a practicable method, but meanwhile they "became the immediate and accessible prey of every crank, enthusiast, fanatic, swindler, and lunatic in or out of Bedlam." Our author's brief history of the Board makes capital reading.

The most remarkable thing in the long history is that between 1714, when the reward was offered, and 1765, when the first half of it was paid, there was only one serious competitor for it, John Harrison, who was brought up as

a carpenter, and never received any proper training as a clockmaker. We wish that Commander Gould had said more on this curious apathy of the regular trade. Why did George Graham, the successor of Tompion, the inventor of the mercurial pendulum and the dead-beat escapement, a Fellow of the Royal Society, and the acknowledged head of his profession, do nothing himself towards solving the problem, in the fourteen years between the Act of Queen Anne and the visit which Harrison made him on his first coming to London, when Graham lent Harrison £200 to help him construct his first machine? Or why, when his old pupil Sully sent him in 1724 the "marine clock" still preserved in the Museum of the Clockmakers' Company, did he take no steps to get Sully back to England and help him develop his other invention, the more promising "marine watch"? Or again, since the reward offered by the British Government was open to the whole world, apparently, how was it that neither Sully nor any other of the ingenious workmen on the Continent turned his ingenuity to the problem, before Harrison had had time to conquer it? Here was £20,000 going begging, and the whole clock-making profession allowed an amateur fifty-one years in which to win it.

The story of John Harrison's struggles to perfect his machines, the dramatic success of the trials at sea, the reluctance of the Board to hand over the principal sum—though they had been generous enough in advances on account—and the King's effective intervention on Harrison's behalf, are told with great skill and sympathy, thoroughly documented, and scrupulously fair to the aggrieved inventor and the cautious Board.

The famous chronometer that won the prize, "Harrison's Fourth," was never allowed to leave the country after its trial voyages to Jamaica and Barbados, but the copies made by Kendall to the order of the Board were soon put into service and proved their worth. The first was sent to sea with Cook in H.M.S. *Resolution*, and its excellent performance is often referred to in his Journal. The first and the third went on Cook's third voyage in the *Discovery*, and were afterwards used by Vancouver and Flinders. The second was lent to Captain Phipps for his Arctic voyage, and afterwards to Captain Bligh of the *Bounty*: was carried off by the mutineers, sold to an American whaler, stolen and sold to a Spanish muleteer, and after other adventures bought by a British naval captain in Valparaiso.

Nevertheless, and despite the success of a few copies, Harrison's mechanism was almost immediately superseded by something much simpler and stronger and less expensive, in the way first shown by Le Roy. In 1766, after several earlier attempts, he presented to King Louis XV. the remarkable "Montre marine" which Commander Gould calls "the first modern chronometer."

"If we contrast this marvellous machine with No. 4, which, in its own way, is equally wonderful, Le Roy's superiority as a horologist is evident. Harrison took the escapement, balance, and general arrangement of the ordinary watch of his day, and by fitting a remontoire and maintainer, an automatic regulator, and diamond pallets, aided by high-numbered wheels and pinions, and lavish jewelling, he compelled it to become an efficient timekeeper. Le Roy attacked the problem from an entirely different standpoint, and obtained his results not by nullifying defects, but by eliminating them. The difference in their machines is fundamental—Harrison built a wonderful house on the sand; but Le Roy dug down to the rock."

But Le Roy, having received the prize of the Academy of Sciences, rested on his oars, and his rival Berthoud it was who competed with the English makers Arnold and Earnshaw for the credit of making the marine chronometer

a commercial success indispensable to every ship. Commander Gould discusses and elucidates but cannot decide the question, which of the three originated the spring-detent escapement that from about 1780 has survived nearly unchanged to the present day. From 1760 to 1780 was a remarkable period. At its beginning the reward of £20,000 was unclaimed. Before it ended the chronometer had become almost standardized, and comparatively little of the first importance has been done to it since. Nevertheless, the latter half of the book under review, bringing the history right up to date, is by no means the less important, and the chapter on the Modern Chronometer and its Management is the most important of them all. Arnold once wrote of his chronometers: "I do not pretend that they may be used as a hammer:" he had to repair those that came back, as well as make new ones. The general principles of care and stowage of chronometers are well known: the hands should be set forwards (never back) by applying the key to the square on the collet; there should be no shake in the gimbals; they must never be twisted in carrying. But there are many smaller points in winding, starting, wedging the balance for transport, etc., which are less known, but of much importance. We hope, therefore, that the work of the author and the enterprise of the publisher will be rewarded by the purchase of this book wherever chronometers are used. The small expenditure will be well repaid.

'The Marine Chronometer' is, in fact, a capital book, on which its author is to be congratulated, and geographers, who owe so much to the instrument, should have been the first to do so. It is more than seven months since we received from the author an early copy of his work. In the interval we have tried to find a reviewer technically competent to appreciate critically his mechanical insight and skilful description. But failing in this, we must no longer delay in commending the work as extremely interesting to a circle much larger than that for which it was first intended. A. R. H.

REVIEWS

Note: Two important books, calling for early notice in the *Geographical Journal*, have come in just too late to be dealt with in the present number. They are, first, Lord Curzon's 'Tales of Travel,' gatherings and personal reminiscences of unusually varied travel, mainly in Asia, but embracing unfrequented spots in three other continents; and secondly, 'The Assault on Mount Everest, 1922,' a composite narrative of the campaign of last year by General Bruce and other members of the expedition. We hope to review both at length in the December number.

EUROPE

Our Home Ports.— S. Coles. London: E. Wilson. 1923. 5*s. net.*

IN this series of articles, reprinted with additions from *Lloyd's List and Shipping Gazette*, the writer has a fascinating tale to relate. The opening chapter contains a brief sketch of the history of commerce through the ages. The writer acknowledges the slightness of his account, yet even so the rise to power of the Western nations might have been made clearer by laying more emphasis upon the blocking of the trade routes to the East by the advent of the Turks, the tremendous opportunities offered by the resulting discoveries in the New World, and Great Britain's advantages for profiting by them. In each chapter, on the individual ports, however, their special advantages are

brought out more fully, and an account given of their present organisation and trade, which is the writer's main interest. Thus the dock system of London is set out in detail, together with suggestions for improvement. As to its future, the writer is on the whole optimistic. It is interesting to note, however, that as a consequence of the war, London is in danger of losing her supremacy in the wool trade.

Without following the author too closely, mention may be made of his description of the recuperation of Southampton and the keen rivalry between Liverpool and Manchester, one stage in this being the construction of the Ship Canal. In the concluding discussion of the position of world commerce generally, and of the situation at home created by the Railways Act of 1921 in particular, the author is less optimistic, fearing in the one case the strength of America's position, and the collapse of European markets, and in the other, the elimination of competition especially where, as at Hull, two previously competing docks have been amalgamated. The book is readable, and is illustrated with clear sketch-maps.

Constantinople—Ses cités franques et levantines.— B. Bareilles. Paris: Bossard. 1918. 24 *frs.*

It is necessary to note at the outset that this book was written before February 1918, so that it necessarily takes no count of recent happenings.

The writer's object is to trace the history of European settlements in Constantinople, especially those of the French. Thus the foundation of Galata by the Genoese is described, the Frankish empire of the thirteenth century eulogized, and the course of French relations with the Turks detailed. A chapter is also devoted to the position of the French language in the educational system. The remainder of the book deals with the various quarters as they are to-day, the social life of their inhabitants, and the situation of the Armenians, Jews, and Greeks. In discussing the economic aspect, emphasis is laid upon the chaos of Turkish finances, and the opportunities for development offered in Syria and Mesopotamia. It is in dealing with this last subject that the writer's point of view becomes pronounced. Recent events would seem to show that it has been adopted by France to a considerable extent.

ASIA

Palestine, the Land of Three Faiths.— Philip Graves. London: Jonathan Cape. 1923. Pp. 286. *Illustrations and a Map.* 12*s.* 6*d. net.*

Palestine has been dealt with in innumerable books from the geographical, historical, Biblical, and archæological sides, but the discussion of its place in modern politics is a modern development. Among the many recent writings which have appeared on this phase of Palestine this volume must take a high position for its accuracy, its restraint, and level-headedness. It deals impartially with the question of the grievances of the indigenous Arab inhabitants of Palestine and with the burning question of political Zionism.

After a vivid sketch of the outstanding geographical and historical features of the Holy Land, the author discusses the whole question of "Zionism"—the history of the "Balfour declaration," the granting of the mandate, the problem of Jewish immigration, and the unfortunate conduct of the extreme Nationalist Zionists. A chapter "A Digression though a Necessary One" deals with the extraordinary and unfortunate literary forgery known as the "Protocols of the Elders of Zion." But the "Arab" grievances receive sympathetic treatment; their difficulties are admitted, but their fears are shown to be groundless. The

natural increase of the indigenous population now that wars and pestilences have been done away will ensure the continued predominance in numbers of the "Arab" element. No scheme within the bounds of financial possibilities could produce a majority of Jews. "Do they [*i.e.* the Arabs] and, for that matter, do the political Zionists realize what it would cost the Zionists to import and settle 50,000 families or 200,000 souls on the land of Palestine? At present, assuming that the country could receive and feed them—which it cannot—it would cost £60,000,000, and even then the Jewish population would be less than half as numerous as the Arab!" Mr. Graves' conclusion—an optimistic one—is that "We must plod on patiently and perseveringly; we cannot go back on our promises or our commitments. We must aid all moderate men of good will, whether Hebrew or Arab, to combine their efforts for Palestine and working for that Semitic synthesis of the Holy Land in which the Jew will play the part to which his most Jewish leaders aspire—the part of intermediary and perhaps one day of mediator, between West and East."

E. W. G. M.

Studies in Religion, Folk-lore, and Custom in British North Borneo and the Malay Peninsula.— Ivor H. N. Evans, M.A. Cambridge University Press. 1923. Pp. vii.+299. *Frontispiece.* 20*s. net.*

Mr. Ivor H. N. Evans is the Curator of the Taiping Museum, and as a trained anthropologist his notes on the Dusuns of North Borneo and the Negritos, Sakai, and Jakun of the Malay Peninsula, must command attention. His information is often fragmentary, but he gives the evidence he has been able to collect with clarity and precision, and he obviously has at heart the interests of the primitive tribes about which he writes. Most of the papers here collected have appeared previously in various scientific journals, and the Borneo studies and folk-tales are supplementary to the account the author has already given of the inhabitants of the Tuaran and Tempassuk Districts in his 'Among Primitive Peoples in Borneo,' reviewed in the *Journal* of July 1922. These two districts were penetrated for the first time by Mr. (afterwards Sir) Hugh Low in 1851 and are perhaps better known to European travellers than any other part of North Borneo; it is to be regretted that Mr. Evans had no opportunity of extending his investigations into the country of the Muruts who, living in the hills of the true interior, are the most primitive, and so the most interesting, of the North Borneo natives. Nor, although he gives some interesting information on the camphor-language used by Malay and Jakun camphor collectors in Johore and South Pahang, has he attempted to collect vocabularies, comparative or otherwise, of the little-known dialects of the Borneo pagans. Nevertheless, his Borneo studies are of particular scientific value because old customs, fashions, and beliefs are passing. It is important that they should be recorded before it is too late, for there is not even a museum in the country, although the neighbouring State of Sarawak has one which is admirably stocked.

Mr. Evans has made an excellent collection of folk-tales both among the Dusuns and the pagans of the Malay Peninsula, and in addition he records many curious facts regarding religious ceremonies, birth, marriage, and burial customs, witchcraft and methods of divination, omens and omen-animals, tabus and superstitions, beliefs regarding natural phenomena, and much else besides. There are no maps in the book and there is only one photograph. On the other hand, there is an unnecessary number of footnotes, and the index, which in a book of this kind is a very important matter, might well have been enlarged

O. R.

The Hot Springs of Japan.— Issued by the Japanese Government Railways under direction of **Frederick de Garis**. Tokyo. 1922. *Map and Illustrations.*

In a recent number of the *Times* it was observed that "Medical hydrology is perhaps the oldest form of treatment in the world, yet only in these last years has it been subjected to scientific study. British spas . . . strangely enough, are but incompletely known to British doctors."

"Ex Oriente lux," for in the land of the farthest East the healing virtues of the many and varied forms of mineral springs are familiar and dear to vast numbers of all classes of this the cleanest nation in the world. Of one such, well known to the writer, mention is made in the oldest extant compilation the Japanese possess—the *Kojiki* ('Records of Ancient Matters'), published in 712 A.D.—which speaks of the *onsen* ("hot spring") of Arima, near the great modern seaport of Kobe, to which the Emperor Kimmei was sent by his medical advisers before the end of the sixth century. Testimony to its fame and to the healing virtues of its waters is borne by an ancient saying: "When you are ill, go either to the doctor or to the *onsen* of Arima; but if you are love-sick neither the spring nor the doctor can cure you."

In the carefully compiled and interesting volume before us, we have the first attempt at setting forth in a complete and systematic form the wealth and variety of the *onsen* with which Nature has so richly endowed this land of mountains and of water in all its forms. While no country in the world possesses so many, the exact number is not yet ascertained, although over 1100 are of sufficient importance to be included in the list already drawn up by the Research Department of the Tokyo Hygienic Laboratory. Of these 951 are classified as hot springs, and 155 as cold, these designations being applied to those above and below 98° F. respectively, and otherwise known as Thermal and Subthermal. The analyses so far carried out show 255 to possess radio-activity in greater or less degree. Speaking generally, it is believed that every chemical element known to the hot springs of the world is contained in one or other of those of Japan. Owing to their remoteness from the beaten tracks of the ordinary European traveller, few are known to the Western world, and it is unfortunate that those with the highest therapeutic value are the most difficult of access, usually in the wild mountain regions and sequestered valleys of unfamiliar Japan. This book therefore is not merely a catalogue of the *onsen* with which it deals, but gives an excellent idea of the romantic scenery in which they are found and of many quaint and interesting features connected with their use among a people of whom the ordinary European traveller knows but little and sees still less. One of these, almost in the heart of the northern Japanese Alpine region, has been in the possession of the present owner's family over three hundred years, and many of its *habitués* stay in the water for practically two or three weeks at a time, taking the precaution, however, when going to "bed," of laying a large stone on the knees to prevent them from "turning turtle" and drowning in their sleep! At some, such as Arima, Beppu, and Ikao, where the chalybeate waters are strongly impregnated with iron, cotton clothing, bath-towels, etc., are frequently dyed in artistic designs at an infinitesimal cost. In some respects the most remarkable *onsen* of all is that of Kusatsu, in Central Japan, where practices are observed which have no parallel in the world.

The springs are of great antiquity, and were known before the dawn of recorded history. Some of the cures effected annually by the combined effects of the high temperature (varying between 120° and 147° F.), mineral acids,

sulphur, arsenic, iron, and alum, in cases of rheumatism, gout, venereal diseases, and chronic skin diseases, are almost miraculous. The normal course involves five baths a day, each lasting three minutes. The bathers, sometimes numbering two hundred at one immersion, are under a sort of military discipline, summoned to the ordeal by the blast of a trumpet or the beating of a drum, and getting in and out at the word of command. The whole is, in fact, a singularly impressive ceremony. W. W.

AFRICA

Algeria To-day.— Lieut.-Col. Gordon Casserly. London: T. Warner Laurie. [1923.] Pp. 262. *Illustrations.* 16*s. net.*

"Less than a century ago the headquarters of the cruellest pirates the world has known—and now a bright and beautiful city of France" (p. 10). So the writer arrestingly introduces Algiers, the city itself occupying a large proportion of this excellent volume. An equally vivid contrast might picture the change France has wrought for the benefit of the whole colony. The passing visitor cannot fail to notice it, but to know all the effort and devotion and wisdom that lie behind it needs the close inquirer who has opportunities of ascertaining facts and methods. Suggestive hints of these this book often gives, but the epic of French colonization has yet to be written. It fell to the lot of the reviewer at one time to dwell on the borders of four colonizations—British, German, Portuguese, and Belgian, and to gain some insight into their comparative merits. Since then he has had much opportunity of observing French methods of colonization in Algeria and Tunisia, and as a result, he is deeply impressed with their excellence. The French do rule for the good of the native peoples, and have wisely taken a leaf (*mutatis mutandis*) out of the book of Roman and Briton and learnt to use the native chiefs in their administration as far as possible.

We may instance some incidental features noted by Col. Casserly. Natives can already vote at Parliamentary elections (the three provinces of Algeria ranking as three "departments" of France) if they are naturalized, which means being subject to French law in such matters as polygamy, etc., but they can, without that, already vote for elections to the *Conseils Municipaux*. "Education is not neglected in Algeria." Certainly not: in remote parts of the most recently occupied districts one sees the schools of the Government and groups of happy school children everywhere. "The Kabyles are avid for it," says the writer, who is closely observant and does not lump all the races in one ("Arabs") as the ordinary tourist does. He, rightly we think, answers in the negative the question: "Does European education teach them to despise their own people and be jealous of the ruling race?" The real triumph of the French in Algeria is that Algerine French and indigenous Berbers alike delight in regarding themselves as "Algerians." Of the wonderful change in the social condition of the Moslem women in the last twenty, or even ten, years Col. Casserly might well have said more. That must be due to education. Unlike the British in India, the French wisely make their subject-races learn French. There is nothing more unifying in a colony than a common tongue.

In Algiers itself the proportion of Europeans is three to one, in Algeria as a whole one to seven. Col. Casserly, in common with some of his French friends, deplores the fact that the colony is "somewhat of a failure" as regards attracting lower-class French settlers, and holds that "when war-stricken France has more money to spare and her financiers and thrifty citizens can be induced to invest their cash in their own dependencies instead of in Eastern Europe, Algeria will return them ample dividends." Yet he recognizes that,

lacking surplus population of their own, they must look, and are looking, to "other Latin races" to supply this deficiency in Algeria.

Geographically the book might be better arranged: that the author jumps from Hammam Meskoutine to Oran without warning is only typical. Room might have been left for more of his valuable information about French development, if repetition of statements had been severely checked. "White-robed men" and the "snow-capped Djurdjuras" are inevitable, but more frequent variation of the adjectives would have been welcome. The photographs are good, there is a useful index, but no map except a rather misleading end-paper. But this is not a book regarding which we should dwell on small faults; it is full of interesting and valuable topographical, ethnographical, and, especially, historical information, and is most readable. W. C. P.

The Lango: a Nilotic Tribe of Uganda.— J. H. Driberg. With a foreword by Sir R. T. Coryndon, K.C.M.G. London: T. Fisher Unwin. 1923. *Illustrations.* 63*s.*

Looking back over the last twenty-five years the growth of our knowledge of the races of East Africa and Uganda is a matter for congratulation, and most of it is due to the unaided efforts of members of the Civil Service of these territories, though the missionaries, too, have helped, especially by their contributions to a knowledge of the native languages.

One of the latest productions is the admirable account of the Lango people by Mr. J. H. Driberg of the Uganda administration. The first half of the book deals with the Ethnology of the Lango, their history and environment being first described, then their physical characteristics, and so on to their mode of life, their social organization, and their religious beliefs. The history of the migrations of the people in the triangular stretch of country, having its apex at Mongalla on the Nile and the extremities of its base at Mt. Elgon on the east and the north end of Lake Albert on the west, is an important problem, bearing on the position of the original home of the Masai, Nandi, and other tribes which have migrated far to the south. Hamitic stocks became fused with earlier Negro races in various proportions and the intermingling probably occurred at intervals during a long period. The causes which forced sections of the product of this mixture southwards were assuredly famine or invasion, but will never be known for certain; close study of the data provided by students like Mr. Driberg will, however, undoubtedly lead to a clearer understanding of the origin of these peoples. It may be suggested that the Uganda government should depute Mr. Driberg to extend his researches to the Bari and Latuka people, for more than a concentrated survey of a limited area is desirable.

It is impossible within a small space to review adequately such a detailed study as has been compiled by Mr. Driberg, but so far as one can judge, the Lango are what one recognizes as typical Nilotic people, and although there are evidences of their association with the Hamitic group, the result has not apparently affected their physical features but is confined to words in their language and certain cultural similarities. Their shields are, for instance, identical with those used by the Koromojo people and bear no resemblance to the great curved shields used by the Ja-Luo, the latter type being probably indigenous to the Nilotes.

The curious bachelor huts called Otogo are astounding erections; raised on piles often 7 feet from the ground, with tiny circular doors, they are surely the most uncomfortable sleeping-places ever devised by man. The author recalls the fact that Emin Pasha recorded a similar form of dwelling among the Madi tribe, but used by the young girls.

The Lango possess considerable courage, and in past time won a great reputation as a fighting tribe. This is curious, for down to comparatively recently they seem to have been poorly armed and depended mainly on clubs and long buffalo hide whips, the use of the spear having been introduced from outside. Since adopting the spear they, unlike most tribes, carry as many as five to ten each. The bow is not used in hunting or war, but a small edition is used for discharging a miniature arrow when bleeding cattle; this is exactly the use of the bow among the Masai.

The religious beliefs of the Lango are somewhat confusing, and the author apologizes for the lack of coherence and for apparent contradictions in his account. Unfortunately, like many native races, they are very reticent about their beliefs. The dominant factor is what is called *Jok*, and there are so many varieties of this force that at times one could almost suspect polytheism, and at others one feels that the various manifestations are only phases of an all-pervading high god; there again seems to be an idea that the *Jok* is the accumulated force of all the spirits of the departed.

The similarity of the Lango language to the Tho-Luo of Kavirondo is remarkable, and if the latter is not derived from the former, they have both undoubtedly come from a common source at no distant date, but space forbids examples of uniformity.

The value of the work is enhanced by the knowledge of the language possessed by the author, and further, it is well to point out that no one who has not undertaken this class of inquiry can have any conception of the labour it entails.

In spite of financial assistance from the Uganda Government, the price of the book is high, and will put it out of the reach of many students. It might have been better to have produced two separate volumes, one on the ethnography and one on the language. C. W. H.

Equatoria: The Lado Enclave.— Major C. H. Stigand, O.B.E. London: Constable & Co. 1923. *21s. net.*

The posthumous book often revives poignant memories, and in this case the tragic death of the author at the hands of frenzied Dinka tribesmen renews regret and sorrow that this gifted officer should have been cut off in his prime in such a petty struggle.

A sympathetic memoir of Stigand's life by Sir Reginald Wingate, his chief during his Sudan service, prefaces the volume. It gives a moving picture of the extraordinary vitality and zeal of Stigand, his strength of character and insatiable appetite for knowledge.

Equatoria might for many years have been called "the buried province." Gordon in 1879 founded Lado Station and, in the face of great opposition from the Arab slave traders, initiated a rude administration of the area; he was succeeded for a short period by Prout and Mason, and a year later by Emin Pasha, who was at first under the nominal control of Gessi Pashi, but in 1878 was given independent command. But Suleiman Zobeir's rebellion in the Bahr el Ghazal, and in 1881 the Mahdi's successful rebellion, speedily cut off all communications between Egypt and Equatoria, and Emin's achievement in keeping the flag flying until he was taken away by Stanley in 1889 makes a marvellous story. Now that the contentious atmosphere of the Stanley relief is long ago dissipated, it is fitting that some one who from residence in the country could actually envisage his difficulties should assess the value of his work.

After these happenings a veil descends over the area; the Dervishes were in control, and the native inhabitants suffered grievously. In 1896 the

Belgians under Commander Chaltin drove the Dervishes out of Rejaf and established themselves at Lado, by virtue of their lease of the Lado enclave from Britain, concluded in 1894. The Belgian attempts at administration were, however, not very effective, and very little information is available of the state of affairs during all these years, but the country appears to have been regarded as a no-man's land by a host of adventurers who found it a congenial field for elephant poaching. In 1909, however, King Leopold died, and by the terms of the lease the territory reverted to Britain and a brighter era gradually set in, for the Sudan Government definitely took over the administration of the area in 1910.

Owing however to its remote situation it has generally held the position of Cinderella among the provinces of the Sudan. It was left for Major Stigand to describe this great territory as a whole for the first time, and his account will enable geographers to picture clearly its physical characteristics.

His chapter on the structure of the Upper Nile Rift Valley is particularly informative, and the description of the extension of the Rift Valley walls for some 200 miles north of Lake Albert is very lucid and very welcome. He possessed true physiographic sense, and we regret that he was not able to give us more about the constitution of the walls of the scarps. He surmises the existence of a transverse fault running S.W.W. from Rejaf, and is possibly correct; there is probably another such fault marked by the bend of the river west of Dufile, for such faults would accord with that across the Rift half-way down Lake Albert, to which Mr. Wayland has drawn attention. The author's opinion as to the recent formation of the main Rift in this region also agrees with the results of recent geological research, and his theories on the course of the Nile in pre-Rift times should stimulate further inquiry.

The detailed descriptions of each district, although they may be a little wearisome to the general reader, will prove of great value to travellers, and his acute insight into the relations of the native tribes will prove of deep interest to future administrators. The shattering of tribal homogeneity is the unfortunate result of the oppression and misrule which prevailed for so many years. The extension of the Ba-Hima or Ba-Huma influence into the Lur country north-west of Lake Albert is interesting, and little known. Emin mentioned that the people on the west side of the lake acknowledged Kabarega's control, but it was not clear that the Lur chiefs were Hamitic Ba-Huma.

In two most interesting chapters the author gives a general review of native ideas and customs. His remarks are perhaps at times a little sweeping, but they are characterized by great insight into the native mind, and this is a faculty not given to many. His energetic mind had little patience, however, with the systematic collection of detailed observations regarding native customs and beliefs, although he never failed to record assiduously everything which came to his notice, and he confesses that he felt that he was groping in the dark. In discussing the languages of the province, the author deals with a subject for which he had a distinct *flair*, and his observations deserve attention. The relationship between the Bari and Latuka on one side and the Masai of Kenya on the other is clearly demonstrated.

Major Stigand's description of the primitive accommodation provided by the Sudan Government for its officers in remote stations is a serious reflection on any administration in these days. It is economically unsound, for the health of its officers is a vital matter for the Government. None of these areas are healthy, and it is not asking much that one spot should be provided

in which the European staff shall be able to live in reasonable comfort an with such protection as tropical hygiene can provide. C. W. H.

AMERICA

Our Southern Highlanders.— H. Kephart. New and enlarged edition. New York: Macmillan Co. 1922. 12*s.*

Partly out of curiosity, and partly in order to study the customs and habits of his ancestors, Mr. Kephart spent several years in the Great Smoky Mountains, in the southern Appalachian region of Eastern America. Here he discovered, cut off almost completely from the outside world, a population of pure-bred American stock of Dutch and Ulster descent, living the life of the eighteenth century. Existing upon a rough cornfield and a litter of razor-back hogs, with bear hunting and illicit distilling as recreation, these mountaineers lead, apparently, a life much akin to the ideal of the philosophers of the eighteenth century, but for the outbreak of occasional blood-feuds. The narrative contains many anecdotes collected by the author during his travels, and is illustrated by some good photographs. On the whole, however, the size and style of the work are rather more pretentious than the matter and treatment appear to require.

On the Spanish Main.— J. Masefield. 2nd edit. London: Methuen. 1922. 8*s.* 6*d. net.*

These sketches are concerned with life on the Spanish Main during the sixteenth and seventeenth centuries. The adventures of Drake and subsequent generations of buccaneers afford material for a full-blooded and warmly-coloured narrative. This opportunity Mr. Masefield, as might be expected, has not neglected. Thus there are picturesque accounts of Drake's expedition of 1572, in which mule trains and Cimmeroons figure largely, of the raids of Dampier and Morgan, somewhat degenerated from the pattern of the Elizabethans, though still as full of fighting, and of buccaneer customs, ships and rigs, guns and gunners. The earlier chapters are based mainly upon Hakluyt and Purchas, for the later, Exquemeling, the Calendar of State Papers, and other contemporary notices of the buccaneers are employed. Altogether, a fascinating account of a period, wild and virile, yet without any great significance for later times.

POLAR REGIONS

A Naturalist at the Poles: the life, work, and voyages of Dr. W. S. Bruce, the Polar explorer.— R. N. Rudmose Brown, D.Sc. London: Seeley, Service & Co. Pp. 316. *Illustrations.* 25*s. net.*

Both as an explorer and as an authority on all that pertains to Polar exploration, the late Dr. W. S. Bruce held, in the eyes of those qualified by experience and knowledge to judge of his work, an extremely high position, won at the price of hardship and penury by a life's devotion to his subject. To the man in the street, however, he was—as compared with Scott, Shackleton, Amundsen, and others—a mere name. This was largely due to that modesty and dislike of publicity which formed so marked a feature of his character. His work was planned and executed upon scientific, as opposed to popular, lines, and he resolutely declined to bid for ignorant applause either by his exploits or his writings. As a consequence of this single-minded devotion to science, it resulted that he was one of the few Polar explorers of note—certainly the only one in recent years—who published no popular account of his work, and the present volume is therefore doubly welcome, both for its own sake and as supplying in some measure that defect.

Being written by an intimate friend and fellow-worker, and containing a complete account of a very full life lived at high pressure, the work could scarcely fail to be interesting; but perhaps its most attractive feature is the admirably judicial and temperate style in which it is written. While sympathizing to the full with his hero—it is not too strong a term—in the hardships and disappointments of which Bruce had more than his share, Dr. Rudmose Brown has invariably refused to become a mere advocate. He writes with restraint and discretion, and by so doing immensely enhances the historical value of his biography.

Five chapters out of twenty-seven are contributed by Mr. W. G. Burn-Murdoch, the well-known artist who accompanied Bruce in the *Balæna* to Graham Land in 1892. These, while perhaps more vivid in style, are suffused with personality—and personalities, some of which might with advantage have been omitted. His recollections are, however, of great value as providing an appreciation of Bruce from a different angle, and at the outset of his career.

Apart from his early work in the *Balæna*, which was thwarted at every turn by the impossibility of combining commercial whaling and sealing with scientific work, Bruce's Antarctic explorations were made in the course of the Scottish National Antarctic Expedition of 1902–4, in the *Scotia*, and of these a full account is given. The title of the expedition itself gives a clue to one of the aspirations nearest its originator's heart—the renascence of a Scottish national spirit. The Caledonian character of the enterprise may be traced in every detail of the *Scotia's* voyage, from the flying of the Scottish national ensign at the fore when entering Madeira—where it was, unfortunately, mistaken for a quarantine flag—down to the presence of a piper on board (one of the illustrations depicts him accompanying an Emperor penguin) and to the reduction of unnecessary expenditure, as compared with that of other expeditions, to a minimum.

The achievements of the *Scotia* included the discovery of Coats Land, the establishment of a meteorological observatory (now maintained by the Argentine Government) on Laurie island, and a large amount of most valuable bathymetrical and oceanographical work, including a conclusive disproof of Ross's celebrated sounding of 4000 fathoms in the Weddell Sea. Unfortunately, it is only too true that, as Dr. Rudmose Brown remarks,

> ". . . It is one of the ironies of Polar exploration that the more work an expedition does the less chance there is of publishing its discoveries,"

and most of the remainder of Bruce's life was spent in an arduous and only partially successful struggle to get the results of the *Scotia's* two years' work published on an adequate scale. The tale of this is pitiful reading, as is that of his Scottish Oceanographical Laboratory, itself a product of the expedition, which had to be closed for want of funds shortly before his premature death in 1921, at the age of fifty-four. Interspersed with them is a narrative of his surveys and explorations in Spitsbergen, which occupied a considerable portion of his all-too-scanty time between 1909 and 1920.

The volume is well illustrated from photographs (although one could wish for a better picture of the *Scotia* herself), and contains two excellent maps, showing the North and South Polar regions. It is interesting to note that the latter retains both Ross's "appearance of land" in about 65½° S., 48° W., and Morrell's "New South Greenland" further southward, both of which are almost certainly non-existent. Bruce always claimed, in the face of strong opposition, and even after the voyage of the *Endurance*, that these reports were to some extent confirmatory of each other, and that the existence of land in these positions remains to be disproved; but it must be admitted that he

stood, and stands, almost alone in this opinion. Perhaps the very animosity with which Morrell's slipshod and bombastic narrative was attacked by Fricker and others may have biased Bruce in his favour. It is pleasant to be told—

"... Bruce would stop in the street to comfort a lost child and lead it home, and he never failed to intervene if he saw an animal being ill-treated, ..."

and it explains much. Many men have been more successful than Bruce, as the world counts success; but Dr. Rudmose Brown's book both contains and is in itself proof that few have ever possessed in greater measure the capacity for inspiring loyal friendship and strong affection. R. T. G.

MATHEMATICAL AND PHYSICAL GEOGRAPHY

The Air and its Ways. The Rede Lecture (1921) in the University of Cambridge, with other contributions to Meteorology for Schools and Colleges.—**Sir Napier Shaw.** Cambridge University Press. 1923. Pp. xix.+237. *Charts and Illustrations.* 30*s.*

Sir Napier Shaw was for many years Director of the Meteorological Office, and his name is closely associated with all the great developments of meteorology which took place during the present century, especially in connection with the investigation of the upper air. On his retirement he became Professor of Meteorology at the Royal College of Science, and he has been able to devote his immense practical knowledge to a broad survey of the fundamentals of the subject. The results have been presented in several important lectures and discussions, which are published here in collected form, together with a few earlier papers and a series of charts showing the distribution of various meteorological elements over the globe, which are for the most part entirely new. There are fifteen papers, and Sir Napier Shaw's versatility is well shown by the fact that while several of them deal with related subjects, together they cover practically the whole field of modern physical meteorology, and there is almost no repetition.

The paper on Cyclonic Depressions, and the two following papers, which together cover eighty-three pages, form by far the most interesting part of the book. They introduce three new principles into dynamical meteorology; the first is the motion of air under balanced forces, which throws light on many features of the daily weather map hitherto not well understood; the second principle is the stratification and "resilience" of the atmosphere due to the fact that under normal conditions temperature decreases upwards less rapidly than is required for free convection. When convection on a large scale does become effective, a third entirely novel principle is introduced, namely the "eviction" of air by turbulent motion between the rising air and that surrounding it. The latter principle has been admirably illustrated by a beautiful little machine devised by Sir Napier, which, as soon as it is set to work, produces a model cyclone as if by magic; this machine is illustrated in Fig. 46.

Of especial geographical interest is the series of twenty-four charts of the globe on a circumpolar projection, showing the distribution over the globe of rainfall, temperature, dew-point, cloudiness, and atmospheric pressure at various levels. Many of these charts are entirely new compilations; the charts of dew-point and cloudiness are important contributions in this respect. The temperature maps are somewhat startling at first, since the isotherms over the sea and land have been drawn independently and no attempt has been made to smooth down the junctions of the isotherms. This is a typical instance of Sir Napier Shaw's alert outlook, for while it is common knowledge that in many parts of the globe the thermal gradient between land and sea is so steep as to be

almost a discontinuity, in all previous isothermal charts this very real phenomenon has been almost entirely obliterated by the cartographer.

It remains only to remark that the production of the book maintains the excellent standard of the Cambridge University Press; the illustrations are very clear and the text remarkably free from typographical errors.

C. E. P. B.

GENERAL

My Journey Round the World.— Lord Northcliffe. Edited by C. and St. J. Harmsworth. John Lane. 1923. 12*s.* 6*d.*

The circumstances under which Lord Northcliffe's last tour was carried out, the shortness of the halts on the way, and the hasty manner in which his impressions were recorded, all tend to minimize the value of this record. Further, the enthusiasm with which he was everywhere received, the inevitable official ceremonies, and those other penalties of greatness, such as the "rising of the ghosts," the term he applied to the frequent meetings with former acquaintances, all encroached upon what time he was able to spare for "sight seeing," and for forming judgments. Thus there are to be found no very profound reflections upon world problems in this book. The matter in which he was most deeply interested, the "White Australia" issue, he dealt with rather vaguely, the practical details of large-scale immigration not being discussed. The same tendency for generalization may be remarked in his rather pessimistic treatment of the Indian situation. When, however, these limitations are recognized, and allowed for, the book remains a vivacious running commentary on men and things, by an alert and interested observer, who succeeds in conveying to his readers much of the colour and movement of the scenes through which he passed. The places which appealed to him most were Peking, Siam, and New Zealand. Peking he notes as the first place he visited where the American and English residents were not longing for home. In Siam he was particularly struck by the ceremony and sumptuousness of the Royal Court.

As a contemporary survey of the world this record will probably increase in value as time goes on.

The Decisive Battles of Modern Times.— F. E. Whitton. London: Constable. 1923. 12*s.*

The fifty years covered by this work saw the rise and fall of Germany, under Prussian leadership, as the great military power in Europe; and it is as a prologue to the history of the Great War that this book is of interest. With the swift victory over Austria, Prussia emerged at last as the undisputed leader of Germany. This justifies the inclusion of the Battle of Königgrätz. The choice of an individual battle in the next struggle is more difficult, for Prussia, at Königgrätz, had won not only a battle but a campaign. Mars-la-Tour, however, being the first great move in the game that ended at Sedan, has strong claims, though, as the author admits, Gravelotte or Sedan might equally well have been chosen. In the last war, the Marne was an obvious choice, marking as it did the first check to the German advance. The other two battles dealt with, Vicksburg and Tsushima, are both concerned with the balance of power in the Pacific, the new world centre. The former, perhaps, illustrates more clearly the influence of geographical factors upon strategy, for it was to secure the line of the Mississippi, and so break in two the Confederate States, that Grant's campaign against that town was undertaken.

Each chapter is prefaced by a historical account of the circumstances bringing

about the battle, and its claim to the epithet "decisive" is discussed. There are several clearly-drawn maps at the end.

Le Domaine Colonial de la France, ses ressources et ses besoins.— **A. Meglé,** Directeur du Comité des Conseillers du Commerce extérieur de la France. Paris: Librairie Félix Alcan. 1922. 12 *frs.*

La mise en valeur des Colonies Françaises.— **Albert Sarraut,** Ministre des Colonies. Paris: Payot et Cie. 1923. 20 *frs.*

These two books illustrate the attention now being paid in France to the opportunities of her great colonial empire. The former is a handbook which describes in a businesslike way the resources and conditions of the colonies, and is apparently intended primarily for business men and travellers. The author gives a brief historical summary, an account of the geography, the population, and the administration of each colony, and then a description of its means of communication, productions and resources, and the opportunities for French trade, with the general information useful in a small guide.

The latter is a larger work with a more ambitious plan. It is mainly concerned with the outline of a colonial policy for the coming years. The author, with the weight of his authority and experience, sketches in considerable detail the work of development, moral and material, in the French colonies, which France, for her own sake and for theirs, should aim to carry out. He explains what has already been done, and gives a chapter to a clear and interesting sketch of the character, spirit, and objects of French colonial policy. The object of the proposed policy is to increase the value of the colonies to France and enable them to play a larger part in her economic recovery, and on the other hand to inspire France with renewed confidence in her civilizing mission as a great colonial power. The book is well illustrated with maps and contains a great deal of statistical information. E. A. B.

The Statesman's Year Book, 1923.— Edited by **Sir J. S. Keltie** and **Dr. M. Epstein.** London: Macmillan. 1923. 20*s.*

The new edition of this standard reference book will be very widely welcomed. Many will turn first to the accounts of some of the new states. These are as full as is practicable, but indicate very clearly how few of these states can yet claim to have settled down to a regular life. Czecho-Slovakia is noteworthy as a marked exception to the general lack of statistics. The maps given show the new divisions of Ireland and of Syria. It is so very rare to find any suggestion of error in this work that the omission of Swansea from the constituent colleges of the University of Wales (page 28) is notable. The book is of steadily increasing value as a work of reference on the present condition of the states of the world. C. B. F.

THE MONTHLY RECORD

EUROPE

Thunderstorm Distribution in Germany.

BY its semi-continental position, involving supplies of oceanic moisture on the one hand, and an extensive summer heating on the other, Germany lies within that part of Europe specially liable to thunderstorms. Among the latest studies of the subject are two by K. Langbeck in the *Meteorologische Zeitschrift*

for September and October 1922, which deal with the geographical factors controlling the distribution over North Germany. This writer attributes the decreasing frequency from west to east (from over 20 to under 20 days annually according to a recent atlas) to the lessened opposition in the east between land and sea influences, and also between mountain and valley influences—both geographical factors being favourable to the interaction of air currents of different temperature which enter into the structure of most thunderstorms. The coastal region experiences the largest proportion of winter thunderstorms; but whereas, during the summer season of highest frequency, the inland regions which are the first to heat up experience a larger proportion of the total than the coastal in May and June, the latter has the higher proportion of the total in July and August. As regards diurnal variation the coast storms tend on the average to occur earlier in the day in the west than in the east of North Germany, but in its mountainous regions the hour of maximum frequency varies greatly from place to place. It thus appears that Germany is not too far east to avoid entirely the winter thunderstorms that are more conspicuous on the west coast of Scotland and Ireland, whilst the summer storms occur with greater frequency and violence than in England. It must be remembered that the essential predisposing condition of all thunderstorms is (1) a steep, vertical temperature gradient conducive to local instability, and (2) a high vapour tension to permit copious condensation, and it is simply because excessive surface heating is so favourable to both that thunderstorms are commonly associated with hot weather. But an unduly cold upper atmosphere is as sure to produce thunderstorms, though of a different type, as unduly warm surface air, and this accounts for many cool weather thunderstorms in summer, as also for winter thunderstorms which in North-West Europe usually occur when cold polar air has been rendered unstable by passing over the warmer Atlantic Drift, which raises both the temperature and humidity of the lower layers.

Orientation of Farm-houses in Schleswig-Holstein.

Much attention has been given in Germany to the geographical distribution of the several types of dwelling-houses, particularly farm-houses, and a fairly large literature has already grown up on the subject. On account of the great variety and mixture of types in Schleswig-Holstein, this region has been dealt with more fully than most from this point of view. In the *Journal* for September 1914, p. 315, reference was made to two papers, by Prof. O. Lehmann and D. W. Pessler respectively, on the house-types of this region, and a special point not there dealt with, namely, the orientation of the houses, is now discussed by Dr. L. Mecking in *Petermanns Mitteilungen*, Nos. 1–2, 1923. Notwithstanding the variety of individual forms, all the buildings fall into the two main types of the Frisian house and the Saxon house, of which the Frisian is specially associated with the grass-farming of the "Marsh," the Saxon with the arable-farming of the "Geest"—these being the chief natural divisions of the district. The Frisian house is markedly long and narrow, and by a process of "contact-metamorphism" it has also impressed its form to some extent on the Saxon house of adjoining areas. Thus even the "Hauberg," which in its original form was essentially square in plan, tends to become oblong in this part of the country. With a long and narrow house the question of orientation would naturally become specially important, and Dr. Mecking finds on a careful inspection of the large-scale survey maps that a large majority of the farm-houses in this area—77 per cent. of the whole—have their longer sides running east and west. Various natural factors may have contributed to this

choice. In the first place the dykes, which more often than not run from north to south, influence the direction of the roads, fields, and houses, the latter being mostly placed at right angles to them. Both the coast-line and the edge of the "Geest" also run from north to south and have a certain influence, at least in the coastal tracts. The desire to secure as much sunshine as possible has no doubt been an important factor, and the common Frisian use of the terms "north stove" and "south stove," "north door" and south door," seems to confirm the view that a definite orientation may be specially characteristic of the Frisian house, being afterwards copied by its Saxon neighbour. But Dr. Mecking ascribes a still greater importance to the prevalent stormy west wind, from which there is no natural shelter in this generally bare and level tract, and to which therefore the builders would oppose the narrower side of the houses.

ASIA

Growth of the Yangtse Delta.

To the *Journal of the North-China Branch of the Royal Asiatic Society*, vol. 53, 1922, H. von Hiedenstam has contributed a detailed account of "The Growth of the Yangtse Delta," with figures showing its rate of progress. In this the two factors are the transporting agent, the Yangtse Kiang, and the receiving medium, the China Sea with its strong semi-daily tides. The area drained by the river system is approximately 756,000 square miles, four times that of France. The effect of the tides are felt 450 miles from the sea. The delta, *i.e.* the land east of the line Yangchow–Chinkiang–Hangchow, lies at the level of ordinary high water, and, though it is dyked considerably higher along the shore, is liable to be flooded by exceptional tides. It is intersected by innumerable canals and streams, up which the tides are continually distributing the alluvium. In the estuarial area, they also break up old islands and banks and form new. The hills of the delta are partially buried mountains, while the lakes, *e.g.* the Tai Hu, are thought to be former portions of the sea. As the result of observations at several points, it is estimated that 400 million tons of silt per annum are being deposited by the Yangtse. This would advance the coast-line one mile every sixty years, thus giving 10,000 years as the time taken by the delta to extend from Chinkiang to its present position. These conclusions have been borne out by independent geological research. Records 4000 years old show that the Yangtse then possessed a delta; though the position of its mouths cannot now be determined, while it is demonstrated that the date of the foundation of a city varies with its distance from the sea. All cities to the east of the line N. Kiangsu–Tungt'ai–T'ait'sang were founded after the fifth century A.D.; of the forty-nine cities west of this line, thirty-two date from the second century B.C. The records of the three successive lines of dykes at Yangtse Cape, in the district of Nanui, corroborate in an interesting way the figures arrived at for the rate of growth. A distance of 6 miles separates the first, built in 1472, from the third, built in 1880, representing expansion of one mile in sixty-seven years. Estuarial changes are illustrated by the history of the island of Tsung-ming. The first island appeared in 696 A.D., but the present one is the result of the consolidation, after many changes, of thirteen distinct islands.

AFRICA

Salt Lakes in Darfur.

We have received from Captain F. A. L. Lawrence, Middlesex Regt., the following report on a sample of water brought by him from the more southerly of the two lakes in Gebel Marra, in Darfur, and submitted to the Government

chemist, Khartoum, for analysis. The water was strongly saline, containing 4·914 per cent. total solids, which consisted chiefly of a mixture of sodium carbonate and sodium chloride, with traces of sulphate and magnesia. Lime was absent. On acidifying, traces of sulphide were evolved. It will be observed that the water is extraordinarily salty, containing nearly half again as much solid as sea-water, and that three-quarters of the solid is carbonate of soda. If these lakes dry up there will be a valuable deposit left.

Survey Work in French West Africa, 1903–1914.

Twenty years ago French West Africa was behind most of the other French Colonies in the matter of survey and mapping, having then no official organization devoted to such work. A beginning was then made, more or less tentatively, and with the experience gradually gained much good work had been done before the war intervened to put a stop to systematic operations. So far little has been known to the public, even in France, of the details of the work, so that the summary supplied by Commandant de Martonne, Chief of the Service Géographique of French West Africa, in *l'Afrique Française* for April 1923, should prove of much value. Issued with official sanction and with the support of the Comité Nationale de Géodésie et Géophysique, it forms, as an extract from the publication above mentioned, a brochure of 44 4to pages. (Commandant de Martonne had previously done a similar service in respect of the Surveys of Madagascar in a memoir noticed in the *Journal*, vol. 60, p. 314.) The earlier efforts, in 1903–05, were in the direction of triangulation in the better-known parts of the colonies of Senegal and the Ivory Coast, but as no complete scheme had been drawn up, they were of a somewhat fragmentary character. For the topographical work the scale first adopted was 1/80,000, but this was soon changed to 1/100,000, and this again to 1/200,000. The geodetic work having proved unsuited for the rapid mapping of the interior, a new departure was made in 1906 which aimed at the supply of a network of positions fixed astronomically, with longitudes obtained by the help of the telegraph. The object being the practical one of supplying the immediate cartographic needs of the colonies, it was thought best to dispense with the accuracy of geodetic methods, which require the adoption of a complete programme from the outset, while the astronomical work can be done in a series of independent operations. By 1911 results of considerable value had been gained, the most important work being perhaps that of Captain Jordan, which occupied two operators for nine months, and yielded nineteen complete positions, besides a certain number of latitudes only. Observations to determine the difference of longitude between Brest and Dakar were carried out in 1910, but were apparently never worked out, and the labour bestowed on them must, it seems, be regarded as lost. The two fundamental positions of Dabakala on the Ivory Coast, and Conakry in Guinea, were however satisfactorily fixed, and altogether eighty complete and seventeen incomplete positions were obtained, mostly in Senegal and in the Upper Senegal and Niger (now French Sudan). Between 1906 and 1911 geodetic operations of the first order were carried out in Guinea, primary chains of triangles being carried from Conakry to the Niger, and from the neighbourhood of Kankan to the upper Ivory Coast. The difference of longitude between Conakry and St. Louis was determined in 1906. Between 1908 and 1913 complementary triangulations were carried out, and extended into the neighbouring colonies in the north and north-east. Altogether 75,000 km. were covered by triangulation of the first order (with 200 geodetic points), and 50,000 by complementary triangulation, the whole depending on five measured bases.

AMERICA

The 1/Million Maps and Handbooks of Spanish America, projected by the American Geographical Society.

We have learned recently, to our infinite regret, that a note published in the *Geographical Journal* for May last, on "The 1/Million Map of Spanish America," has been misunderstood by the Director of the A.G.S. and some of his correspondents, who read into it a certain hostility to the plan of research which was announced in the *Geographical Review* for January 1921, pp. 1, 2, and further explained on p. 293 of vol. 11 for that year. They found in our note "an assumption that the Society [the American Geog. Soc. of New York] has transgressed its legitimate functions and embarked upon an enterprise which it is not properly entitled to pursue." The root of this unfortunate misconception seems to lie in the phrase: "They form in fact a pirate series analogous to the series of Europe and the Near East which we compiled at the R.G.S. during the war for the General Staff; but with this difference, that the American enterprise is undertaken in cold blood." Such are the evil results which attend the picturesque style: and none of the sentences following were enough to remove the first unfortunate impression. Yet we had hoped to make it clear that in our own experience there were solid advantages in such a scheme as that inaugurated by the publication of the La Paz sheet, and that these were far more than sufficient to counterbalance the purely formal objection that by the strict terms of the original convention such sheets would not form part of the official 1/M map. The publication of these 1/M maps of the A.G.S. is a necessary part of their broad scheme of research, including the preparation of monographs and handbooks on selected regions, in addition to special distribution maps on various scales; and the whole important enterprise has been made possible by the generosity of some members of the Council, A.G.S.

By discussing the La Paz sheet apart from its accompanying handbook (which was reviewed separately), we inadvertently laid too much stress upon the 1/M map, which was the part of the enterprise that from old associations interested us especially, and this no doubt contributed to the misconception we are most anxious to dispel.

Proposed Canal across Southern South America.

The *Bulletin of the Pan-American Union* for February 1923 contains an article by Senor Rodriguez del Busto on "An epoch-making engineering project"—the construction of a canal across the southern extremity of South America. This scheme was debated and approved at the International Congress of Engineering, held at Rio de Janeiro September 1922. The central idea is the utilization of the Lago Buenos Aires, lying in the Andes on the Chile-Argentina frontier, about 47° S., both as the main reservoir and as part of the canal itself. Its position is favourable, since the Gulf of San Jorge on the east and the Golfo de las Peñas on the west greatly reduce the width of the continent in this region. The lake itself, with the adjoining Lago Bertrand, is 180 kilometres in length, and is navigable throughout. Except for the outlet at the eastern end which feeds the Rio Deseado, and another at the south-western shore through which the Rio Baker flows on its way to the Southern Pacific, the lake is enclosed by high mountains. The altitude of the eastern shore is 500 metres above sea-level, that of the south-western 222 metres. It is proposed to construct a dam across the bed of the Rio Baker, at this point about 150 metres wide, which would raise the level of the lake to that of its

eastern end and increase its area. For the western section of the canal, by the construction of the necessary locks, the bed of the Baker would be used. This section would be approximately 195 kilometres long: for its last 75 kilometres, the Baker is navigable by vessels of considerable draught. The third section, roughly 275 kilometres, leaving by the eastern outlet mentioned above, would descend to the plains, first on a course roughly parallel to that of the Rio Deseado, then striking north-eastward to the Atlantic near Comodoro Rivadavia. The total length of the canal would be approximately 650 kilometres. No estimate of the probable cost, time, nor other details are given. The advantages afforded to South American trade by the completion of such a scheme are easily appreciable.

The Gravel-and-Sand Beds of the Puna of Atacama.

In a paper published at Leipzig in 1920, Herr Walther Penck described in some detail the extensive gravel-and-sand deposits of the dry upland region of the Puna of Atacama in North-West Argentina, and the neighbouring tracts which form a transition region towards the pampean sierras. He ascribed these beds, which in places reach a thickness of 40 or 50 metres, to the effect of present-day conditions, holding that the material, formed in the first instance by the fall of rock masses from the mountain sides, would gradually creep down to the lower levels on account of its uncompacted texture and the operation of marked extremes of temperature. In a recent number of *Petermanns Mitteilungen* (1923, Nos. 1–2) Dr. Passarge contests this view on several grounds. He says that the downward flow of the whole mass on a slope of 3° to 4° is unlikely, the motion being possible only near the surface; that by Penck's own account there are stream-beds cut to a depth of 40 or 50 metres in the deposit in question, which must therefore be fairly well compacted; that the observed rounding of the fragments could not be caused by the slow motion postulated; that the aridity of the region is exaggerated by Penck, for it is subject to frequent snowstorms, and the formation and movement of the masses are capable of explanation on more normal lines: moreover, even in the still drier parts of the desert the material is known to be well compacted. Other considerations, however, raise a doubt whether the deposit is after all a present-day one, and not rather a diluvial formation. as it is allowed by Penck to be when it occurs on the sierras further east, The question can only be solved by further study on the spot.

HUMAN AND HISTORICAL GEOGRAPHY

Geographical Influences on Stock-raising in the Mediterranean.

The *Annals of the Association of American Geographers*, vol. 12, 1922, contains an article by Miss E. C. Semple on "The influence of geographic conditions upon ancient Mediterranean stock-raising." The title might well have been more comprehensive, as the writer does not neglect opportunities of demonstrating the social and political effects of the requirements of stock-raising upon the inhabitants of the Mediterranean Basin. After an exposition of the general factors, climatic and physical, governing the breeding of domestic animals, each Mediterranean country is dealt with in detail. The nomadic tribes from the great eastern plains, pushing down into the Mediterranean lands, found themselves debarred by its physical features from pursuing their former way of life. The mountain barriers prevented the keeping of immense herds, besides which, owing to the summer drought, the coastal plains, except in special cases, only provided pasturage for half the year. Thus sedentary

agriculture became the chief occupation, and stock-raising was limited by the quantity and quality of summer mountain pasture available. The consequent annual migration of the herds had a bad effect upon tillage, as six months' supply of animal manure was lost. For those animals retained for farm work, fodder crops, chiefly alfalfa, were grown in the dry season by irrigation. In general, the quality of mountain pasture deteriorated from north to south, and from west to east, of the Mediterranean region. The deciduous forests of the rainy districts in the north and west, such as Northern Spain and the Po valley, supported large numbers of pigs: in drier regions, *e.g.* Palestine and the interior of Asia Minor, sheep and goats alone could support life. Cattle and horses, requiring the best pasture, were raised on marsh meadows, and in regions where irrigation was possible. Thus, except under the extended empire of Solomon, they were rare in Palestine, but comparatively plentiful in the Nile valley and delta, the Po valley, Thrace and Thessaly, whence came Alexander's horse, Bucephalus. The lack of meat as an article of diet stimulated tunny fishing and the cultivation of olives. Even in Italy the horse was sufficiently rare to be associated with the patricians; in general, oxen, asses, and mules were employed for transport and agriculture. In war, countries which could maintain large numbers of cavalry, Thrace and Bœotia, for example, were sought after as allies. The quantity of cattle and horses being thus limited, the value of breeding by artificial selection was early recognized. Egyptian horses were improved by the introduction of Libyan and Cilician strains, while for this purpose, and also to meet the demand created by chariot racing, horses were exported from Spain, Thrace, and Venetia. The demand for sacrificial victims without blemish may have improved breeds, in Palestine for instance. Cotton being unknown, and flax only cultivated in the Nile valley, special attention was paid to producing good quality wool from sheep and goats. Famous centres for them were Athens, Tarentum, and Gades. Cows were also brought from the Alps to improve the herds of the Po valley, still a great cheese-producing district. Later breeds were also improved by animals originating in the herds of the nomads in contact with the frontiers of the Roman Empire. As the writer points out, the same factors are exercising similar effects to-day.

GENERAL

Geography at the British Association.

Owing to the necessary curtailment of the length of the *Journal* during and since the War, it has been found impossible of late years to print, as was formerly the custom, a full account of the geographical section of the British Association, with the *verbatim* report of the President's Address. We can give here only a brief summary of the chief subjects of geographical interest dealt with at the Liverpool meeting, 13 to 19 September 1923. The omission of a fuller report is of less importance, as fairly full abstracts of the Presidential Addresses and certain other papers and lectures are to be found in *Nature*. In his address as President of Section E, which attracted considerable attention, Dr. Vaughan Cornish dealt in a suggestive way with "The Geographical Position of the British Empire." After describing its position, lying symmetrically about a line running from Canada through the Suez Canal to India and Australia, he showed how it performed an intermediate function, commercially, strategically, and racially, in world affairs. Though strategically (in its bearing, for example, on France and her possessions in Indo-China, or on America and the Philippines) this position would enable her to block their lines of commu-

nications in war-time, Dr. Vaughan Cornish laid special emphasis on the *rôle* of the British Empire as a binding rather than a disruptive force. In India and in Kenya Colony, for example, Great Britain was the connecting link between the white and coloured peoples of the world. That she might continue to play so beneficent a part, he urged the need for a higher birth-rate at home.

As is usual at the meetings of the Association, many of the lecturers in the various sections dealt with local questions. In three short lectures, Messrs. Hewitt, King, and Moore described "The region round the Mersey and Dee Estuaries," showing the dependence upon the physiographical features of the distribution of population and industries, and the lines of future development. A discussion in Section C (Geology), on "The Geography of the Liverpool District from pre-glacial times to the present," was opened by Sir Aubrey Strahan, who attempted to account for the preference shown by the Romans for the Dee rather than the Mersey estuary. Rejecting the theory that the latter was of post-Roman origin, he attributed their choice to the existence of obstacles to navigation, probably remnants of Neolithic land surfaces. In this connection the present work of the tides on the south Lancashire coast was illustrated by Mr. C. B. Travis. Other lectures of local interest were given in this section by Prof. G. Hickling on the "Tectonics of the Lancashire Coalfield," and in the anthropological section by Prof. E. Ekwall on place-names and the early history of Lancashire. Among other lectures worthy of note were those of Prof. J. L. Myres, on the geographical factors in the historic *rôle* of the Marmora region, and Sir A. J. Evans on the light thrown by recent discoveries on the development and influence of Cretan civilization. A joint discussion between the Geographical and Anthropological Sections urged the need for the co-operation of geographers, historians, and anthropologists in the study of Man.

Lost Mercator Maps.

In reference to the note on this subject in the August number (p. 138) Dr. Albert Tiberghien, of the Royal Library at Brussels, writes to point out that the title-vignette of the lost map of Germany has been known for some years from two copies bought by the said Royal Library in 1868, together with the gores of Mercator's Globes of 1541 and 1551, at the sale of the collections of Mr. Benoni Verhelst at Ghent. They were used, it seems, in the same way as the copy now reported from Rome, to receive the titles of other documents—in this case the two globes referred to. The ornamental cartouche has an outside measurement of about 20 × 13 cm., the title proper occupying the interior of a circle 49 mm. in diameter. The paper of the Brussels specimen is the same as that on which the globe-gores are printed, with the horn (already much used in those days) as water-mark. Dr. Tiberghien suggests that the use of this vignette for maps other than the "Teutschland" for which it was originally printed may possibly indicate that this map was never issued. This may be so, but the same argument might have been used in regard to the America, the vignette of which is similarly used (in the Rome set) for quite a different map. Yet we know from the Plantijn records that the America was actually on sale.

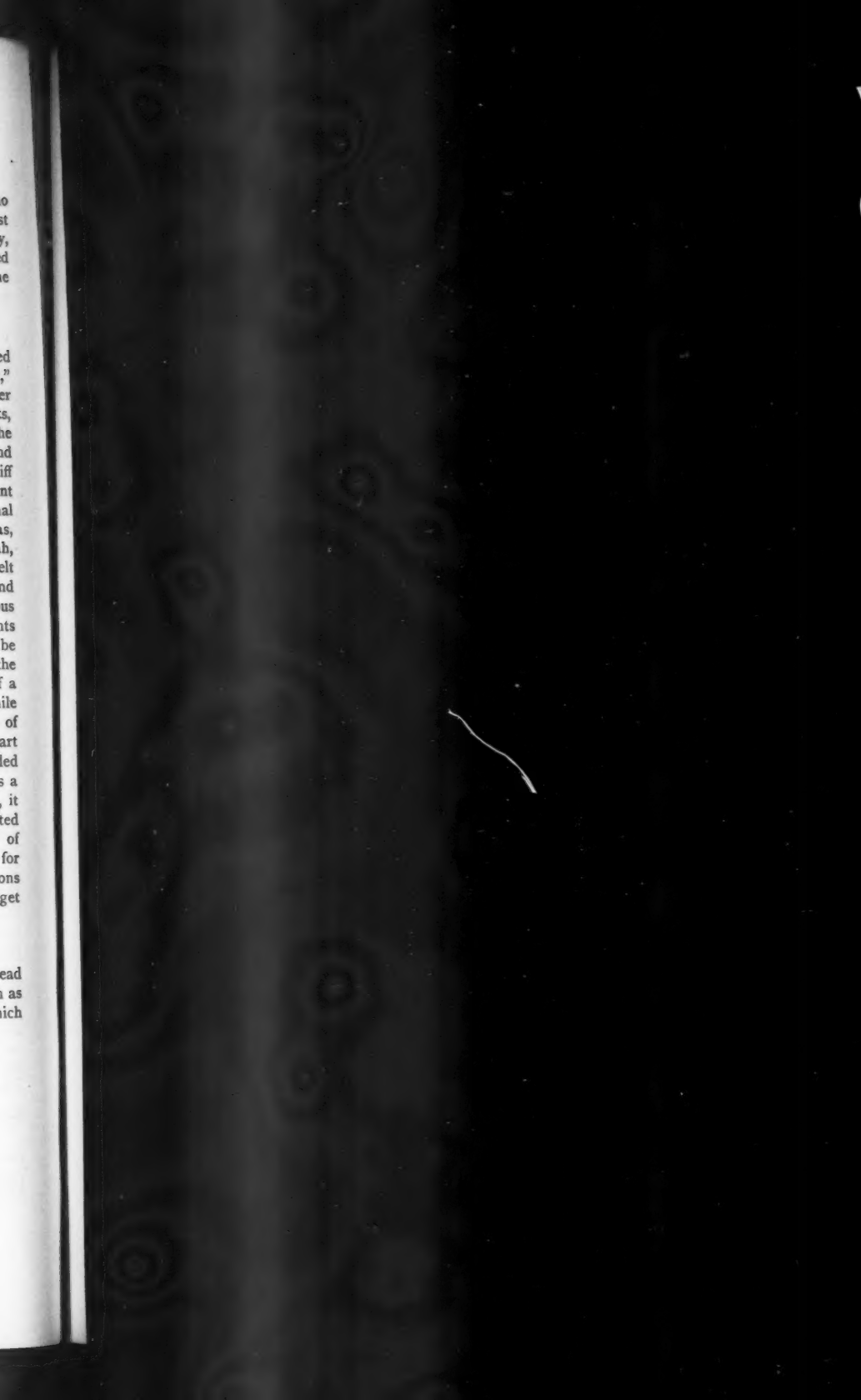
Geophysical Papers.

We are glad to call attention once more to the Geophysical Supplement to the *Monthly Notices of the Royal Astronomical Society* inaugurated in March 1922, of which three numbers have so far appeared, containing papers on Seismology, Wireless Time Signals, the Elastic Stability of the Earth, Map

Projections, Terrestrial Magnetism, and the Variation of Latitude. Those who are not members of the R.A.S. can obtain the Supplements, at a price just sufficient to cover the cost of publication, by applying to the Assistant Secretary, R.A.S., Burlington House, London, W.1. The three numbers already issued cost 7*s.* 6*d.* in all, but a deposit of 10*s.* should accompany application, the exhaustion of which deposit will be notified in due course to subscribers.

National Parks and Reserves.

The June number of the New York *Country Life* contains a well-illustrated article by Mr. LeRoy Jeffers entitled "Little Journeys off the Beaten Track," which is calculated to arouse the envy of lovers of outdoor life in other countries. It dwells on the benefits arising from the system of national parks, by means of which large and picturesque areas have been secured for the American public. Among the varied features thus preserved are to be found the pick of the mountain scenery both in the east and in the west, the cliff dwellings in Mesa Verde National Park, and a recently active volcano, Mount Lassen (see *Journal*, August number, p. 154), in the Lassen Volcanic National Park. The purpose of the article is to urge the acquisition of further areas, for instance, the sand-dunes of Lake Michigan, the Bryce Canyon in Utah, and the High Sierra of California, in connection with the proposed Roosevelt National Park. It is obvious what an appeal this system must make to all, and not least to field geologists and to teachers of geography. With us, for obvious reasons, similar efforts have been confined to securing historical monuments and comparatively small beauty spots. In this connection mention may be made of the recently published report of the "National Trust." Among the acquisitions recorded therein are St. Boniface Down, Ventnor, the gift of a private individual, Great Bookham Common, and Leith Hill Tower, while further additions have been made to the Box Hill estate. Since the date of the report it has been announced that a considerable area in the western part of the Lake District, including some of the highest summits, has been handed over to the Trust by the Rock and Fell Climbing Club of the district as a memorial of members of the Club who fell in the Great War. In general, it would appear that the full enjoyment of our countryside is chiefly prevented by misunderstandings between owners and the public. The recognition of their respective responsibilities in this matter would remove the necessity for such measures as that dealing with public rights of way which the Commons and Footpaths Preservation Society have lately been endeavouring to get through Parliament.

Errata in the August Number.

On page 138, line 4 of Article on Mercator Maps, for "surveying" read "surviving." On page 142, line 9, the proper name should have been given as General Von Ungern-Sternberg. The general held the rank of Baron, which belonged to both the German and Russian branches of the family.